ANNALS of SURGERY

A Monthly Review of Surgical Science and Practice Edited by LEWIS STEPHEN PILCHER, M.D., LL.D., of New York

ASSOCIATE EDITORS
W. SAMPSON HANDLEY, M.S., M.D., F.R.C.S., of Loadon
JAMES TAFT PILCHER, B.A., M.D., of New York,
JOHN H. JOPSON, M.D., of Philadelphia.

Official Publication of the American Surgical Association of the New York Surgical Society and the Philadelphia Academy of Surgery.

CONTENTS

MALIGNANT EPITHELIAL TUMORS OF THE NECK OF UNKNOWN ORIGIN	-
JOHN E. MCWHORTER M.D. THE MANAGEMENT OF INTRA-ORAL CANCERS AT THE RADIUM INSTITUTE OF	
	×
GEORGE T. PACE, M.D. TREATMENT OF ACUTE POST-OPERATIVE THYROID TOXEMIA	
	6
FIBRUSARCUMA UN THE THYRUID	9
WILLIAM O. JOHNSON, M.D	
	0
PRIMARY HYPERNEPHROMA OF THE LIVER	13
THOMAS L. RAMSEY, M.D. THE SPREAD OF BACTERIA FROM THE GALL-BLADDER TO THE LIVER	
	7
	8
ALFRED STILLMAN, 2D, M.D. LEFT VAGUS SECTION AND PARTIAL GASTRECTOMY FOR DUODENAL ULCER	
	8
EUGENE KLEIN, M.D. SAFETY FACTORS IN RESECTION OF STOMACH FOR GASTRODUODENAL ULCERS	0
LATE RESULTS IN PERFORATED GASTRODUODENAL ULCERS	3
TIPLE DUODENAL ULCERS	
LHOMAS MARTIN TOYCE, M. D.	
	8
GEORGE W. VAN GORDER, M.D. RECONSTRUCTION OF THE HIP-JOINT IN CONGENITAL DISLOCATIONS	6
TO ANSOT A WIT A TION OF THE PETERS WOD THEFT A DABLE TO A ADDRESS THE ADDRESS TO A ADDRESS THE ADDRESS TO A ADDRESS THE ADDRE	e
W. Lowndes Peple, M.D. BRANCHIAL CYSTS OF THE PAROTID GLAND	
WILLIAM F. CUNNINGHAM, M.D.	4
WILLIAM F. CUNNINGHAM, M.D. TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY AND THE PHILADELPHIA	
ACADEMY OF SURGERY	8
TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY	2
STATED MEETING HELD FERWARY 27, 1929. BRIEF COMMUNICATIONS: Wellbrock: Sarcoma of the Breast with Foreign-Body and Tourse.	
Giant Cells. de Younna: An Improved Drainage Tube. Long: Retroperitoneal Hernite 15	4

R LIPPINCOTT COMPANY DURI ISLIPPO

IODIPIN 40%

IODIZED VEGETABLE OILS MERCK

Contrast Medium Myelography—Bronchography

2 Cc. ampuls and bottles of 25 Gm.

Literature on request

MERCK & CO.

Rahway N. I.

Have You a Patient Who is a Poor Heat Risk?

When slow convalescence, lowered resistance, old age, or the necessity for emergency operations make you apprehensive of the possible effects of summer hear on your patient,

Gray's Glycerine Tonic Comp.

(Formula Dr. John P. Grei)

2-3 tablespoons in a wineglass with cracked ice is a surprisingly effective restorative and strength sustainer. It maintains appetite and digestion, and prevents heat depression.

Samples and Literaure on Request

The Purdue Frederick Co. 135 Christopher St., New York, N. Y.

ANNALS of SURGERY

Vol. XC

JULY, 1929

No. 1

MALIGNANT EPITHELIAL TUMORS OF THE NECK OF UNKNOWN ORIGIN

By JOHN E. McWhorter, M.D.

OF NEW YORK, N. Y.

FROM THE FIRST (COLUMBIA UNIVERSITY) SURGICAL DIVISION, BELLEVUE HOSPITAL

There are probably no surgical conditions more difficult to diagnose clinically than malignant epithelial tumors of unknown origin located in the neck. In a series of twenty-four such cases, admitted to the First Surgical Division of Bellevue Hospital, New York City, the correct diagnosis of carcinoma or epithelioma was infrequently made. The usual diagnosis in these cases was either Hodgkin's disease or lymphosarcoma, though occasionally they were thought to be either a parotid tumor or a tuberculous lymph node.

In this series of cases from the adult surgical service of the First Division, the tumors were either excised or tissue was removed for biopsy. Unfortunately all these cases were not followed up, and but few came to necropsy.

The origin of these tumors is little understood and is largely a matter for academic discussion. As their microscopic picture does not indicate their origin, it is impossible to determine whether they arise primarily from some vestigial structure or secondarily from some unknown focus.

Historical.—Relatively little has been written about malignant epithelial tumors of the neck, yet they appear to be a distinct type. In 1882 Richard Volkman in his paper "Das Branchiogene Hals Karcinoma" first described branchiogenetic carcinoma. In the ten years previous he had seen only three of these cases. They were not secondary to a primary focus elsewhere, nor did they arise from the lymph nodes. They all occurred in men between forty and fifty years, and occurred more frequently on the left than on the right side. They were at first of firm, scirrhus consistency, but later underwent a mucoid softening that gave them the consistency of a fluctuating tumor. growth was usually very extensive, reaching upward to the base of the skull and involving the great vessels of the neck and the larynx, this latter involvement resulting in respiratory distress. The skin was not attached to the mass, but was usually raised in folds. He describes in detail two cases, one of which had a large, fluctuating, inoperable mass that eroded the carotid artery and caused death by hæmorrhage; while in the second there was a large, dense tumor behind the hyoid bone, involving the great vessels of the neck and the pharynx. He emphasizes the difficulties to be met with in the excision of this tumor. He says that microscopically these tumors are of the squamouscelled cornifying epithelial type, "hornkrebs" with isolated areas of cylindrical epithelium, the stroma being very thick and sclerotic. He states that the general opinion is that these tumors arise from remnants of the branchial cleft and remain quiescent until stirred into activity by some unknown irritation. He also connects these tumors with branchial cysts, or branchiogenetic chondromata, and closes with the suggestion, "We surgeons must in general believe in Cohnheims theory that tumors from embryonic rests are Volkman had not seen subcutaneous carcinoma in the usual sites of embryonic rests with the exception of the three tumors noted. Tinker 2 collected from different sources fifteen malignant epithelial tumors of branchial cleft origin.

JOHN E. McWHORTER

Cohn a quotes Coley whose opinion was based on 167 cases of malignant tumors of the neck, that the most common variety is round-cell sarcoma. Cohn mentions the relative frequency of carotid body tumors.

McKenty 6 collected from the Royal Victoria Hospital, Montreal, five undoubted cases of branchiogenetic carcinoma. He emphasizes their rapidity of growth and their site as being behind and below the angle of the jaw. Pain, though frequently absent in early cases, is usually severe and caused by involvement of nerves. He considers that epitheliomas of the neck that do not involve the skin or mucous membrane, and for which no primary focus can be found elsewhere, should be looked upon as branchiogenetic carcinoma. He emphasizes the necessity of a thorough examination of the mouth, pharynx and larynx, "as a growth not as large as a split pea" may give rise to very extensive metastases.

Ewing ⁵ states that these tumors usually occur after forty; that they may be globular, cystic or solid, and are usually of cystic growth. He raises the question as to how many of these malignant neoplasms of the neck of obscure origin are referable to branchial rests. He thinks this is not determined, but feels, however, that in all secondary carcinomas it should be possible to demonstrate the primary growth, and that the structure of these neoplasms is commonly that of an adult acanthoma.

Carp and Stout of think that branchiogenetic carcinoma is rare as they collected but four cases from the Presbyterian Hospital, New York City. Evidently it is their opinion that the majority of these tumors are secondary to some other site. It is their contention "that even an autopsy is not conclusive" as the primary site may have been overlooked.

Hudson 7 states that the prevalent opinion on malignant epithelial tumors of the neck is that they are divided into two groups—those made up of squamous epithelial cells that are secondary to a healed or undiscovered focus, and those arising from vestigial remnants, which are uncommon. The latter neoplasms occur in two main types: (a) branchiogenetic carcinoma and (b) endothelioma; the latter tumor having a structure similar to that of an endothelioma of the salivary glands. At the Middlesex Hospital there were ten of these cases during the ten years covered by Hudson's paper. It is his opinion that these tumors arise in the jugulo-digastric lymph glands, an oval, flattened structure about 2.5 centimetres in length, which is situated on the mesial aspect of the great jugular vein and extends from the posterior belly of the digastric muscle to the tip of the superior cornu of hyoid bone. This is the main drainage station for the external auditory meatus, Eustachian tube, nasopharnyx, tonsils, tongue and epilaryngeal structures.

Because of the extreme malignancy of these tumors and their surgical importance, a study of the unusually large number of cases available in the Bellevue series may be found of value.

Sex and Age.—Of the twenty-four cases, eighteen were those of males and six those of females. The average age was forty-seven, the oldest sixty-eight, the youngest thirty-seven years, and only three under forty. Apparently neither sex nor age is a determinative factor, as the males among these cases averaged fifty years of age, and the females forty-five.

Duration.—In the majority of the cases the average duration of symptoms was somewhat less than four months, with an extreme variation in one case of two years, and in another of one week.

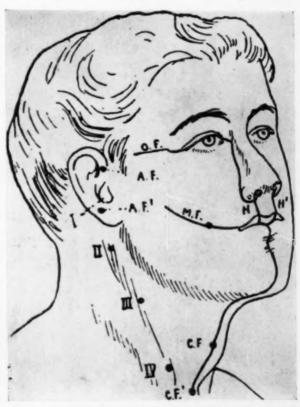
Site.—A few of the patients showed a bilateral involvement with a ratio of six to eighteen. In a unilateral involvement the left side predominated—thirteen to five. With but few exceptions these tumors arose in a rather restricted area, namely, around the angle of the lower jaw. This position

EPITHELIAL TUMORS OF THE NECK

corresponds to that of the jugulo-digastric gland of Hudson's, or the great jugular lymph node as it is more commonly named by anatomists. As will be shown later, the position of this tumor and its intimate relationship to the great vessels of the neck are of the utmost importance from the operative point of view.

Probable Site of Origin.—In only three instances were there any definite

signs suggestive of a primary site elsewhere in the body. In one case the left tonsil presented a tender, small, indurated area that clinically resembled an epithelioma, but as tissue was not excised for biopsy the diagnosis was not confirmed. The second showed an indurated, ulcerated area in the gum of the lower jaw, with a direct extension from this to the tumor at angle of mandible. Evidently it was a primary epithelioma of the gum. The third case gave a suggestive history, but rather indefinite physical signs of an intra-abdominal tumor in the left lower quadrant. Unfortunately this case did not come to necropsy.



How many of these tu-Most of the malignant neoplasms arise at site 11.

mors arose from some primary focus other than the neck is purely a question for speculation, but certainly if they did arise elsewhere, the most careful physical examination failed to reveal it.

It is evident that to be able to determine with any degree of accuracy the origin of these tumors is of great surgical importance. For if they are primary, one might consider the advisability of an operation with some hope of success, but if they are but the external signs of some remotely placed malignant growth the prognosis is not encouraging. In considering this question it must be borne in mind that in our series, with the exceptions noted, no primary focus, elsewhere in the body, was ever definitely proven. It would be, therefore, in our opinion, not unreasonable to assume that at least a certain percentage of these neoplasms do arise primarily in the neck from some small epithelial rest.

JOHN E. McWHORTER

Symptoms.—The history is usually the same. The tumor grows without symptoms until it has reached sufficient size to be seen and felt. The condition is a progressive one with the mass gradually, in most instances, increasing in size, but in some cases it grows with extreme rapidity. Pain is a variable factor and occurs in over half of the cases; when present it is severe and described as being sharp and shooting. Respiratory distress and dys-

Formation and action and action and action and action action and action action

Fig. 2.—Anatomy of neck (Deaver *). The circle indicates the approximate position of all the tumors discussed in this article.

phagia were present in a considerable number of instances. The presence or absence of these symptoms is a good indication of the amount of involvement: when present one must assume that the growth is diffusely infiltrating, when absent, that it is probably circumscribed. It is quite obvious that where the involvement is bilateral the symptoms are more marked than when unilateral.

Physical Signs.

—In most instances these tumors occupied an area immediately posterior to the angle of the jaw, in the region of the great jugular lymph node. (Fig. 2.) The

mass was usually large, either smooth or lobulated and of firm and dense consistency. The tumor was attached rarely to the skin, but frequently to the deeper structures. Occasionally the growth involved both the deep and superficial structures and not infrequently, when this occurred, the skin over the surface was red, swollen and tender. As these physical signs were more suggestive of an abscess than they were of malignancy, the latter condition was frequently unsuspected. Tenderness, except in diffuse growths, may or may not be present.

Differential Diagnosis.—The problem of differentiating these malignant

EPITHELIAL TUMORS OF THE NECK

tumors from other masses in the neck is one of extreme difficulty. Ewing ⁵ mentions that they may be confused with carcinoma from aberrant thyroid follicles, tumors of the carotid body and primary endothelioma of lymph nodes. Hudson ⁷ differentiates them from primary endothelioma of lymph glands, carcinoma of parotid, carotid body tumors and branchiogenetic tumors. His differentiation is as follows:

- 1. Endothelioma of lymph node when single can be diagnosed only by microscopic section.
- 2. In carcinoma of the parotid the tumor is largely confined to the gland and spreads from there to cheek.
- 3. Carotid body tumors are situated at a lower level in the neck and are globular and of irregular outline.
- 4. Branchiogenetic tumors arise from preëxisting cysts, are cystic in some parts, and occur at a lower and more medial level.

In the First Surgical Division of Bellevue Hospital, on adult surgical service, all the tumor-like masses of the neck, other than those of the thyroid and obvious metastases, were in their indicated order of frequency of the following kinds. This series of 177 cases includes those from which tissue was removed for sectioning, and covers a period of ten years, 1919–1928 inclusive.

Tuberculosis		0.0 0	56
Epithelioma, unknown origin	****		14
Mixed tumors of parotid			7.5
Lymphosarcoma			6.5
Branchio- and thyroglossal cysts			6
Hodgkin's disease			4

We appreciate that the surgical conditions and their order of frequency, as given in the above table, may not correspond to the findings in similar wards of other hospitals; but because of Bellevue's acute surgical service and enormous turnover of patients, they no doubt are a fair sample of surgical conditions in general. In our experience the clinical diagnosis of malignant epithelioma of the neck cannot be made with any degree of certainty. However, a hard, fixed tumor of comparatively rapid growth, situated somewhat behind and below the angle of the jaw, must always be regarded with grave suspicion until its character has been proven by microscopic section.

Prognosis.—As far as we know the follow-up on these cases, in all hospitals, is exceedingly discouraging. McKenty ⁴ in his series from the Royal Victoria Hospital has a mortality of 100 per cent. In Hudson's ⁷ six cases, four died within eleven months, while the follow-up on the remaining two was of too short duration to be of any value. Unfortunately, in most of our cases the follow-ups were incomplete, but we feel justified in assuming that the ultimate result, with possibly a few exceptions, was as hopeless in the unfollowed cases as it was in those that were followed. This assumption offers for evidence the fact that most of these cases were inoperable when first seen and rapidly progressive when lost track of.

JOHN E. McWHORTER

Pathology.—Macroscopic.—In most of the Bellevue cases the neoplasm had advanced to such an extent that the specimens removed were only for biopsy, either in the form of enlarged lymph nodes or fragments from the tumor itself. Involved lymph nodes usually showed rather extensive areas of degeneration surrounded by masses of soft, homogeneous tissue. In certain areas the nodes were not degenerated, but on the contrary solid and of a rather firm consistency. The tumors excised varied in size, but usually averaged from seven to four centimetres in diameter. Most of them were

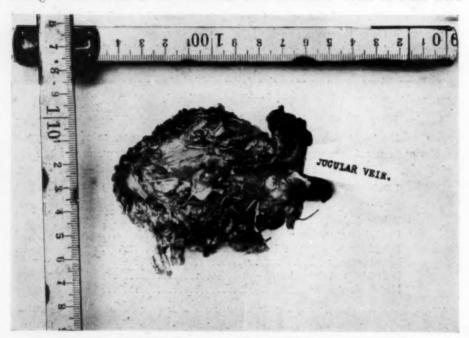


Fig. 3.—Case IV. Gross specimen of circumscribed mass surrounding internal jugular vein.

circumscribed and appeared to be encapsulated. They were either globular in shape, lobulated, or had a distinctly nodular appearance. From the shape of these tumors and their apparent encapsulation, one is frequently amazed at the amount of adjacent tissue involved.

In one recent case the tumor surrounded and was intimately adherent to most of the great vessels of the neck, and had infiltrated inward to the pharynx and downward almost to the supraclavicular fossa. In addition, the cervical lymph nodes on the opposite side were extensively involved. (See chart, case IV, and Fig. 3.)

On section all of our tumors were of firm consistency throughout, the cut surface being smooth and of a rather homogeneous appearance. In not a single specimen was there any evidence of cyst formation. This might well raise the question as to whether the tumors excised were primary growths or secondary involvement of lymph nodes. Neither from the gross specimen nor microscopic section could this be determined with any degree of certainty. The above findings again introduce the subject of their origin. For if, as has

EPITHELIAL TUMORS OF THE NECK

been suggested by Ewing, Hudson and others, most branchiogenetic carcinomas arise from a preëxisting cyst, then it is evident that this statement is either incorrect or that our tumors were not of branchiogenetic origin, or the masses removed were secondary growths and not the primary focus. This seems to be a question that is little understood, rather a matter for speculation and one that cannot be proven.

Microscopic.—The histological make-up in our series of tumors was in



Fig. 4.—Photomicrograph, low power, showing usual arrangement of cells in most of the neoplasms in this series.

most ways similar to that described by Volkman, McKenty and Hudson: usually consisted of a mass of more or less undifferentiated epithelial cells. In some cases these cells were more highly differentiated and resembled rather closely squamous epithelium, but on the whole they tended toward the embryonal type with cells that were rather large and of irregular shape, though somewhat columnar. The cytoplasm was rather scanty and stained poorly, while the nuclei were large, prominent, highly chromatic and showed many mitotic figures. Practically without exception the Bellevue series of tumors showed a very definite cellular arrangement. This constant pattern was that of a network of epithelial cells, arranged in strands of various breadths, together with a very marked tendency of these cells toward an alveolar arrangement. In many instances these tumors in addition to this

JOHN E. McWHORTER

formation showed, in areas, the cells massed together in the form of sheets, these structureless masses resembling closely syncytium. Because of the tendency of these tumors in their growth to form a more or less complex network, they might, if one chose to use a descriptive term, be called plexiform epithelioma. The connective-tissue stroma varied considerably in the different tumors, but as a general rule it was very cellular, so much so, in fact, that in certain areas it closely resembled a spindle-celled sarcoma. This

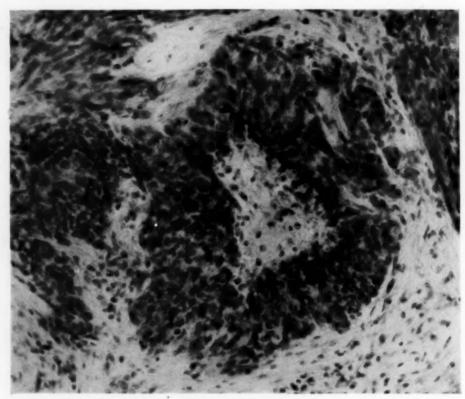


Fig. 5.—Photomicrograph, high power, showing tendency of cells to columnar shape and attempt at alveolar arrangement.

cellular character of the stroma appeared to indicate the rapidity of the growth: for the more cellular and undifferentiated the cells, the more diffuse and rapidly growing was the tumor; while the more differentiated and adult the connective tissue, the less rapid and more circumscribed the growth appeared. Another marked and outstanding feature, in a very large percentage of these tumors, was the amount of necrotic or degenerated tumor tissue. Naturally this varied considerably in the different cases, the controlling factor seemingly depending upon the rapidity of growth. In common with other rapidly growing malignant neoplasms, these tumors were, as a general rule, very vascular.

Diagnosis.—For want of a better name, we have called these neoplastic growths malignant epithelial tumors of the neck. As their origin is unknown,

EPITHELIAL TUMORS OF THE NECK

any further attempt at a classification would be without value and a mere matter of juggling words. However, for purposes of record and filing some nomenclature that in a measure describes the microscopic picture, such, for example, as plexiform epithelioma or alveolar epithelioma, would, perhaps, serve the purpose quite as well as any other term.

Treatment.—Of all the difficult problems which from time to time the surgeon is forced to face, there is, perhaps, none more difficult than the

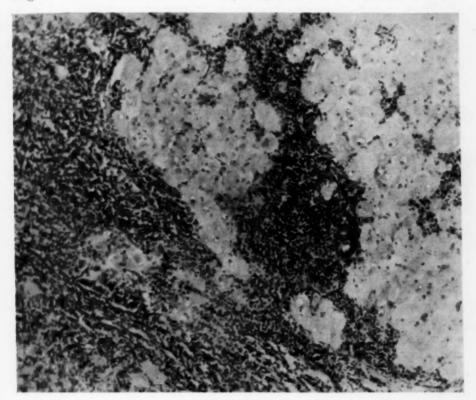


Fig. 6.—Photomicrograph, low power, showing slight alveolar arrangement and mass of undifferentiated cells invading muscle.

proper treatment of these tumors. The first problem to be solved is that of diagnosis, which in most instances cannot be made clinically, but is dependent upon the biopsy. Having arrived at a diagnosis, the next question for discussion is whether or not this growth is primary or secondary. If primary, small and localized, one might well consider the proper procedure to be that of excision. If, however, this local growth be but secondary to some deeply seated primary focus, then an excision, if the symptoms warrant it, must be considered a palliative measure and not a cure.

This decision is of sufficient importance to make it worthy of very serious consideration. In most instances, due to lack of knowledge, it probably cannot be made. There are, however, a sufficient number of malignant tumors arising elsewhere in the body and occasionally metastasizing, to the cervical

lymph nodes to make all deeply seated epithelial growths in this region open to suspicion. For these reasons it is our opinion that an operation should only be considered after a careful, physical examination has failed to reveal a primary focus elsewhere. On the other hand, when considering the treatment of these neoplasms, one must not overlook the probability that many of them may be primary in the neck, and unless we have evidence to the contrary it is not reasonable to assume that they all must be secondary.

There is one more point that arises relative to the advisability of an operation and that is the position of these tumors. The majority are rather deeply seated, usually diffusely invasive, and are intimately connected with the great vessels of the neck. This makes the operation one that requires considerable technical skill and an intimate knowledge of the local anatomy.

In the treatment of this condition it may be of interest to briefly mention the experiences of McKenty and that of Hudson. McKenty ⁴ considers these tumors highly malignant and an operation is not a satisfactory form of treatment. Hudson ⁷ believes that in a great majority of cases surgical excision is uniformly disappointing and recurrence usually rapid and fatal, and considers the operation difficult and hazardous, and advises, for want of a better therapeutic measure, the use of radium.

Our experience agrees with these authors, for we do not believe that a surgical excision can be looked upon as a cure, and we are somewhat skeptical as to the value of radium. Certain exceptions must be taken to the statement regarding the inadvisability or futility of an excision. In a few instances, where the tumor is rather small and evidently encapsulated or circumscribed, it might well be a primary growth. In that event an excision would be, by all means, the treatment of choice; but in our series it could seldom be considered for in the vast majority of cases the tumor was inoperable when first seen. Of the two methods of treatment we would, as a general rule, recommend radiation, for an excision, excepting in a few rare cases, seems to stimulate the tumor's growth rather than retard it.

SUMMARY

In summation it may be said:

I. A study of these cases in an adult surgical service in Bellevue Hospital shows that malignant epithelial tumors of the neck are far more common than is generally supposed, and are frequently mistaken for Hodgkin's disease and lymphosarcoma.

2. That practically all these tumors occupied an area behind and below the angle of the jaw and in the majority of cases were unilateral.

3. That their origin was unknown. Probably some were secondary to a remote primary focus, but this could not be proved.

4. That diagnosis is extremely difficult, in most cases it can be made only by microscopic sections, as the clinical findings are frequently not sufficiently characteristic to differentiate it from other masses in the neck. When a mass located below and behind the angle of the jaw gives a history of a gradual

EPITHELIAL TUMORS OF THE NECK

or rapid growth, this tumor should always be considered as a possibility.

5. That the treatment, either by excision or radiation, seems to be equally unsatisfactory. Excision in particularly favorable cases, or as a palliative measure to relieve symptoms, may at times be considered, but that the difficulties of this operation cannot be overestimated.

6. In most cases the prognosis was bad, as the tumor when first seen was inoperable.

Case I.—Age fifty-three, male. Admission date, October 9, 1928. Site—Left side of neck, angle of jaw. Duration—One month. Symptoms and Physical Signs—Swelling below angle of jaw, rapidly increased in size; no pain, respiratory distress or dysphagia; tumor mass 5 cm. in diameter, adherent to deeper structures, not to surface; no tenderness. Clinical diagnosis—Carcinoma. Pathology, gross and microscopic—Circumscribed mass 7 x 5 x 4 cm. Surface shows a series of discrete nodes, very dense; mass of columnar cells in branching strands showing distinct alveolar arrangement, many mitotic figures. Pathologic diagnosis—Epithelioma. Treatment—Excision and radium. Follow-up recent case.

Case II.—Age sixty-one, male. Admission date, October 16, 1928. Site—Left side of neck, angle of jaw. Duration—Three weeks. Symptoms and physical signs—Following slight blow developed pain and noticed swelling of neck; no respiratory distress or dysphagia; tumor 8 x 4 cm. angle of jaw, from mastoid to middle of sternomastoid, attached to deep tissues; tender. Clinical diagnosis—Carcinoma. Pathology, gross and microscopic—Diffuse mass 6 x 5 cm., cut surface resembles a number of discrete lymph nodes, very dense; diffuse mass of squamous epithelial cells arranged in strands, many pearls and mitotic figures. Pathologic diagnosis—Epithelioma. Treatment—Excision. Follow-up—Died post-operative, cerebral hæmorrhage.

Case III.—Age sixty-two, male. Admission date, May 15, 1928. Site—Left side of neck, angle of jaw. Duration—Four months. Symptoms and physical signs—Noticed stiffness of neck, later tumor mass, sharp, shooting pain; tumor mass 6 cm. in diameter, attached to deep structures; hard and tender. Clinical diagnosis—Carcinoma. Pathology, gross and microscopic—Biopsy; small circumscribed node; mass of columnar cells in branching strands showing alveolar arrangement, many mitotic figures. Pathologic diagnosis—Epithelioma. Treatment—Inoperable biopsy. Follow-up—Progressive, lost.

Case IV.—Age sixty-five, male. Admission date, May 10, 1928. Site—Left and right side of neck, angle of jaw. Duration—Five weeks. Symptoms and physical signs—Mass in left and right side of neck rapidly increased in size, tenderness, dysphagia; mass at angle of left and right jaw 7 cm. in diameter, tender; attached to deeper structures. Clinical diagnosis—Carcinoma. Pathology, gross and microscopic—Large infiltrating mass 6×5 cm. involving vessels of neck; mass of interlacing strands, columnar epithelial cells, alveolar arrangement, many mitotic figures. Pathologic diagnosis—Epithelioma. Treatment—Excision of mass from right and left side. Follow-up—Died post-operative, following excision of mass from right side.

Case V.—Age thirty-seven, male. Admission date, February 23, 1928. Site—Right side of neck, angle of jaw. Duration—Ten weeks. Symptoms and physical signs—Noticed mass right side, gradually increased in size, dysphagia, sharp pain; tumor mass at angle of jaw, extensive growth, not attached to surface. Clinical diagnosis—Hodgkin's disease. Pathology, gross and microscopic—Biopsy; mass of broad, branching columnar-shaped cells, having alveolar arrangement, many mitotic figures. Pathologic diagnosis—Epithelioma. Treatment—Tissue for biopsy. Follow-up—October 25, 1928, extensive local recurrence, distant metastases, condition terminal.

CASE VI.—Age fifty, female. Admission date, February 6, 1928. Site—Left side of neck, angle of jaw. Duration—Two months. Symptoms and physical signs—Mass in neck, no pain; extensive growth, lower angle of jaw, deeply adherent. Clinical diag-

JOHN E. McWHORTER

nosis—Metastatic carcinoma. Pathology, gross and microscopic—Biopsy; diffuse mass of undifferentiated epithelial cells, slightly suggests glandular arrangement, mitotic figures. Pathologic diagnosis—Malignant epithelial tumor. Treatment—Lymph node for biopsy. Follow-up—Home A.O.R. unimproved.

CASE VII.—Age sixty-six, male. Admission date, September 7, 1927. Site—Left side of neck, angle of jaw. Duration—Five months. Symptoms and physical signs—Noticed small lump, rapidly increased in size, hoarseness, cough, pain; large, extensive tumor mass fixed to deeper structures, tender. Clinical diagnosis—Carcinoma. Pathology, gross and microscopic—Biopsy; mass of branching columnar-shaped cells having alveolar arrangement, many mitotic figures. Pathologic diagnosis—Epithelioma. Treatment—Biopsy, inoperable. Follow-up—Transferred to Department of Public Welfare, condition progressive, lost.

CASE VIII.—Age fifty-six, male. Admission date, October 25, 1926. Site—Left side of neck, angle of jaw. Duration—Eight weeks. Symptoms and physical signs—Tumor mass gradually increased in size, sharp, shooting pain; hard mass 6 cm. in diameter; skin over surface red, tender and hot. Clinical diagnosis—Parotid tumor. Pathology, gross and microscopic—Tissue for biopsy; mass of broad branching strands, columnar-shaped cells having alveolar arrangement, many mitotic figures. Pathologic diagnosis—Malignant epithelial tumor. Treatment—Biopsy, inoperable. Follow-up—Condition progressive, lost.

CASE IX.—Age forty-five, female. Admission date, November 12, 1926. Site—Left side of neck, angle of jaw. Duration—Two years. Symptoms and physical signs—Mass in neck gradually increased in size, pain; large tumor mass 8 x 2 cm., deeply adherent, tender. Clinical diagnosis—Tuberculous lymph nodes. Pathology, gross and microscopic—Encapsulated mass 4 x 3 x 2 cm. On section firm, cut surface lobulated; mass of epithelial-like cells in broad, branching strands, pigmented areas, mitotic figures. Pathologic diagnosis—Melanocarcinoma. Treatment—Excision. Follow-up—No recurrence at end of eight months.

Case X.—Age forty-seven, male. Admission date, January 16, 1926. Site—Right side of neck, angle of jaw. Duration—Four weeks. Symptoms and physical signs—Mass rapidly increased in size, pain and hoarseness; mass in neck 3 x 2 cm., firm, movable, tender. Clinical diagnosis—Tuberculous lymph nodes. Pathology, gross and microscopic—Biopsy; diffuse mass of epithelial cells in broad strands, alveolar arrangement, mitotic figures. Pathologic diagnosis—Epithelioma. Treatment—Biopsy, inoperable. Follow-up—Unimproved, lost.

CASE XI.—Age thirty-nine, male. Admission date, September 9, 1925. Site—Right side of neck, angle of jaw. Duration—Four months. Symptoms and physical signs—Tumor mass gradually increased in size, no pain; hard mass about 4 cm. in diameter, adherent to deep structures; no tenderness. Clinical diagnosis—Tumor of neck. Pathology, gross and microscopic—Biopsy; infiltrating mass of glandular epithelium in branching strands having primitive acini, mitotic figures. Pathologic diagnosis—Carcinoma. Treatment—Biopsy, inoperable. Follow-up—Unimproved, lost.

Case XII.—Age sixty-seven, male. Admission date, February 26, 1925. Site—Right side of neck, angle of jaw. Duration—Six months. Symptoms and physical signs—Tumor mass rapidly increasing in size, painful; hard, lobulated mass 3 x 6 cm. attached to angle of jaw. Clinical diagnosis—Sarcoma. Pathology, gross and microscopic—Mass of enlarged lymph nodes; diffuse mass of epithelial cells in broad branching strands, many mitotic figures. Pathologic diagnosis—Epithelioma. Treatment—Partial excision of jaw and lymph glands. Follow-up—Died three days post-operative.

CASE XIII.—Age forty-nine, female. Admission date, April 16, 1925. Site—Right side of neck, angle of jaw. Duration—Six months. Symptoms and physical signs—Tumor mass in neck gradually increased in size, no pain; mass below angle of jaw freely movable. Clinical diagnosis—None. Pathology, gross and microscopic—Encapsulated mass 2.5 cm. in diameter, firm, with necrotic areas; diffuse mass epithelial cells in strands

EPITHELIAL TUMORS OF THE NECK

with alveolar arrangement, necrotic areas, mitotic figures. Pathologic diagnosis--Malignant epithelial tumor. Treatment--Excision. Follow-up--No recurrence seventeen months later.

CASE XIV.—Age thirty-eight, female. Admission date, August 6, 1925. Site—Left and right side of neck, angle of jaw. Duration—Seven months. Symptoms and physical signs—Noticed mass in left and right side, rapid increase in size; dysphagia, cough and hoarseness, no pain; large adherent mass both sides, many enlarged glands. Clinical diagnosis—Hodgkin's disease. Pathology, gross and microscopic—Mass 1.5 cm. in diameter, degeneration of extensive areas; strands of undifferentiated epithelial cells, alveolar arrangement, mitotic figures. Pathologic diagnosis—Carcinoma. Treatment—Tissue for biopsy, inoperable. Follow-up—Condition progressive.

Case XV.—Age forty-five, male. Admission date, June 25, 1924. Site—Left side of neck, angle of jaw. Duration—Five days. Symptoms and physical signs—Noticed painful swelling in neck; hard, movable mass 2 cm. in diameter, surface hot and tender. Clinical diagnosis—Fibrosarcoma. Pathology, gross and microscopic—Several large lymph nodes, centre necrotic; mass undifferentiated epithelial cells, mitotic figures. Pathologic diagnosis—Epithelioma. Treatment—Excision. Follow-up—Following excision, prompt and extensive recurrence in two months.

CASE XVI.—Age forty-two, female. Admission date, February 27, 1924. Site—Right and left side of neck, angle of jaw. Duration—Five months. Symptoms and physical signs—Mass gradually increased in size on both sides of neck; tumor mass on both sides, very dense, freely movable. Clinical diagnosis—Lymphosarcoma. Pathology, gross and microscopic—Large mass 5 x 3 cm. very firm; strands of columnar epithelial cells, alveolar arrangement, mitotic figures. Pathologic diagnosis—Malignant epithelial tumor. Treatment—Excision and X-ray. Follow-up—Prompt recurrence in two months, extensive bilateral involvement; died following second operation.

Case XVII.—Age fifty-seven, male. Admission date, March 7, 1924. Site—Left side of neck, angle of jaw. Duration—Seven weeks. Symptoms and physical signs—Tumor mass, rapid growth, pain and cough; tumor 7 cm. in diameter, very dense. Clinical diagnosis—Carcinoma. Pathology, gross and microscopic—Circumscribed mass 7 x 5 x 3 cm. firm, degenerated areas; strands of epithelial cells, alveolar arrangement, many mitotic figures. Pathologic diagnosis—Epithelioma. Treatment—Partial excision. Follow-up—Recurred in two months, ulcerated and progressive.

Case XVIII.—Age forty-six, male. Admission date, January 12, 1923. Site—Right side of neck, angle of jaw. Duration—Three months. Symptoms and physical signs—Mass in neck, rapid growth; marked loss of weight; tumor mass in neck, adherent to deep tissues; tender. Clinical diagnosis—Metastatic tumor. Pathology, gross and microscopic—Enlarged, firm lymph nodes; infiltrating mass epithelial cells, tendency toward glandular arrangement. Pathologic diagnosis—Carcinoma. Treatment—Inoperable biopsy. Follow-up—Condition progressive, referred to St. Rose's Home for incurables.

CASE XIX.—Age sixty-eight, male. Admission date, March 13, 1923. Site—Left side of neck, angle of jaw. Duration—One year. Symptoms and physical signs—Mass in neck, rapid increase in size, pain and dysphagia; diffuse tumor mass, adherent to deep and superficial structures. Clinical diagnosis—Malignant tumor. Pathology, gross and microscopic—Biopsy; diffuse mass epithelial cells. Pathologic diagnosis—Carcinoma. Treatment—Inoperable biopsy. Follow-up—Progressive, lost.

Case XX.—Age fifty-nine, male. Admission date, March 24, 1922. Site—Left side of neck, angle of jaw. Duration—Six months. Symptoms and physical signs—Tumor gradually increased in size, pain, dysphagia; mass 5 x 8 cm. adherent to deep structures, hard and tender. Clinical diagnosis—Tumor of neck. Pathology, gross and microscopic—Biopsy; mass epithelial cells arranged in strands, mitotic figures. Pathologic diagnosis—Malignant epithelial tumor. Treatment—Inoperable biopsy. Follow-up—Condition progressive, lost.

CASE XXI.—Age sixty-five, male. Admission date, July 3, 1922. Site—Right side of

JOHN E. McWHORTER

neck, angle of jaw. Duration—Four months. Symptoms and physical signs—Mass, rapid growth, pain; tumor mass 6 cm. in diameter, ulcerated on surface, tender. Clinical diagnosis—Carcinoma. Pathology, gross and microscopic—Biopsy; mass epithelial cells arranged in strands, many mitotic figures. Pathologic diagnosis—Epithelioma. Treatment—Inoperable biopsy. Follow-up—Referred to General Memorial Hospital, lost.

Case XXII.—Age fifty-two, male. Admission date, August 18, 1922. Site—Left and right side of neck, angle of jaw. Duration—One and one-half years. Symptoms and physical signs—Mass gradually increased in size, recent, rapid growth; mass attached to deep structures hard and tender. Clinical diagnosis—Sarcoma. Pathology, gross and microscopic—Infiltrating, hard mass 7 x 5 x 5.5 cm.; mass epithelial cells arranged in strands, mitotic figures. Pathologic diagnosis—Epithelioma. Treatment—Excision. Follow-up—Condition unimproved. Referred to Home for Incurables.

CASE XXIII.—Age forty-two, female. Admission date, February 28, 1921. Site—Left side of neck, angle of jaw. Duration—Five months. Symptoms and physical signs—Tumor was excised, rapid recurrence in scar; tumor at site of scar. Clinical diagnosis—Hodgkin's disease. Pathology, gross and microscopic—Biopsy; mass of undifferentiated epithelial cells in strands showing alveolar arrangement, mitotic figures. Pathologic diagnosis—Epithelioma. Treatment—Patient operated upon one year ago, radium; inoperable biopsy. Follow-up—Following excision one year ago and radium, condition now inoperable and progressive.

CASE XXIV.—Age forty-six, male. Admission date, November 29, 1920. Site—Left side of neck, angle of jaw. Duration—Two months. Symptoms and physical signs—Noticed small mass, rapid increase in size; stony, hard tumor attached to deep structures. Clinical diagnosis—Branchiogenetic carcinoma. Pathology, gross and microscopic—Firm nodular mass involving vessels of neck; undifferentiated epithelial cells and strands, alveolar arrangement, mitotic figures. Pathologic diagnosis—Carcinoma. Treatment—Large resection, radium. Follow-up—One year later extensive recurrence, now inoperable.

REFERENCES

- Volkman, Richard: Des tiefe branchiogene Halscarcinom. Zentral. f. Chir., vol. 1x, p. 49, 1882.
- Tinker, Martin B.: The End Results of Treatment in Certain Forms of Malignancy of the Neck. Arch. Surg., vol. lxxvi, p. 335-340, 1922.
- ³ Cohn, I.: Masses in the Neck. Amer. Jour. Syphilis, vol. ii, pp. 67-82, 1918.
- ⁴ McKenty, F. E.: Tumors of the Neck. Surg., Gyn. and Obstet., vol. xix, pp. 141-151,
- ⁶ Ewing, James: Neoplastic Diseases, p. 1023, Saunders, Philadelphia, 1928.
- Carp, Louis and Stout, A. P.: Branchial Anomalies and Neoplasms, vol. lxxxvii, pp. 186-209, 1928.
- ⁷ Hudson, Rupert Vaughn: The So-called Branchiogenetic Carcinoma: Its Occupational Incidence and Origin. Brit. Jour. Surg., vol. xiv, pp. 280-294, 1926.
- Bland, Sutton J.: On Branchial Fistulæ, Cysts, Diverticula and Supernumerary Auricles. J. Anat. and Phys., vol. xxi, pp. 289–298, 1887.
- Deaver, John B.: Surgical Anatomy, vol. ii, p. 70, plate 165, P. Blakiston's Son & Co., Philadelphia, 1904.

THE MANAGEMENT OF INTRA-ORAL CANCERS AT THE RADIUM INSTITUTE OF THE UNIVERSITY OF PARIS

By George T. Pack, M.D.

OF NEW YORK, N. Y.

The purpose of this paper is to report the technical details and principles involved in the management of intra-oral cancers at the Radium Institute of the University of Paris, together with certain personal observations, impressions, and comments.

Because all treatment is based upon the histological diagnosis of the cancer, a biopsy is performed upon every tumor as soon as the patient presents himself at this clinic. This is an absolute prerequisite for treatment inasmuch as the authorities believe that even when the diagnosis of cancer is evident, histologic study will reveal information concerning the variety and the radio-sensitivity of the tumor in question, which will be invaluable for post-radiation statistical analyses; furthermore, it contributes to the prognostic evaluation of the tumor and influences the choice of the methods of treatment.

If the tumor has been treated by radium or X-radiation elsewhere, the patient ordinarily is not eligible for admission to the clinic. This is not a hard-hearted policy, because the Curie Foundation is not principally for immediate charity, but for the purpose of bettering the existing methods of cancer treatment and to establish a rational scientific basis for radium therapy. This necessitates the primary treatment of the cancer, otherwise the variable radiation dosage used in other institutions, the lack of the original histologic data, and the factor of acquired radioresistance unite to confuse the radium and X-ray therapist.

If the radiation dosage is great but insufficient, or incorrectly timed or incorrectly spaced, then within six weeks to two months the tumor may develop a radioresistance which persists indefinitely. The statistics of the Radium Institute indicate that the efficiency of the radiation treatments diminishes rapidly with their increasing number. An improper first treatment may render a neoplasm incurable by radiation. Professor Regaud believes that the Röntgen ray is not successful after radium has failed. On the contrary, recurrences after X-radiation are occasionally susceptible to radium treatment. When association of the two modes of radiation is purposely planned, it is advisable to have the Röntgen ray therapy always precede the treatment by radium.

The Regional Classification of Cancers of the Tongue.—(a) The dorso-lingual anterior area—"pars anterosuperior linguae"—situated anterior to the lingual V, formed by the vallate papillæ. (b) The dorso-lingual posterior area—"pars posterosuperior linguæ"—situated behind the lingual V and extending into the fauces and hypopharynx. (c) The inferior lingual area and floor of the mouth—"pars infra-linguæ".

This localization of lingual cancers has been adopted at the Radium Institute for several reasons. The cancers peculiar to these regions have significant variation in histologic structure; they are endowed with different biological qualities and behavior characteristics; the treatment of each group constitutes a different radiological and surgical problem.

The Histological Types of Lingual Cancers.—Histologically, the comparative malignancy of the lingual cancers ascends in the following order: dorso-lingual anterior cancer < infralingual cancer < dorso-lingual posterior cancer. The exophytic papillary cancers are less malignant than the ulcerative, infiltrative cancers of the same location. For many years Doctors Regaud and Lacassagne have graded the histological characteristics of tumors in a manner somewhat similar to the method which has become recently popularized as "Broder's Index of Malignancy". In their conservative way they do not attach undue significance or value to this finding, because of the observation that in some instances biopsies from different parts of the same tumor may show several different degrees of cellular differentiation.

The French school distinguishes between two types of differentiation or cellular evolution of epidermoid carcinomas, namely, a cutaneous and a mucous membrane metamorphosis. Both types occur among the intra-oral group of cancers. The terminal product of keratinization of the type cutaneous consists of sterile squamous sheets, where the protoplasm is changed to keratin or to a substance analagous to keratin. These sheets are end products; they are deprived of nuclei; sometimes this substance is encysted or sequestered in the tissue depths as cornified globules or "pearls". Sometimes this differentiation is complete and typical; sometimes there is failure to differentiate, and in other instances it is atypical or of an intermediate degree. This group of cancers is more common among the epitheliomas of the lip and of the dorsum of the tongue, particularly the cancerization developing on plaques of leucoplakia. In the dorso-lingual posterior and infra-lingual areas the cutaneous type of epidermoid carcinomas is quite uncommon.

The cellular metamorphosis of the type mucosæ begins in the centre of large cords or lobules of epidermoid carcinoma. The nucleated squamifying tissue detaches itself and undergoes autolysis within its cavities, or in the event of failure to evolute the large and clear nucleated cells persist, or if evolution is complete, concentrically lamellated globes or pearls of nucleated cells appear, bearing more or less resemblance to the cornified pearls of the cutaneous type.

The lympho-epithelioma of Regaud is a tumor entity of interesting nature. It frequently occurs in the tonsil and base of the tongue. The surface epithelium of the lingual and faucial tonsil lives in close symbiotic relationship with the underlying lymphoid tissue. These epitheliomas usually produce voluminous lymphadenopathies while the primary lesion is barely discernible. Histologically and biologically it is a very malignant tumor.

The Radiosensitivity of Intra-oral Cancers.—The comparative radiosensitivity of the lingual cancers ascends in the following order: dorso-lingual anterior cancer < infra-lingual cancer < dorso-lingual posterior cancer. It is definitely established that in the course of its existence a cell or a line of cells (cancer especially) passes through alternating phases of radiosensitivity and radioresistance. The cells are particularly radioresistant when for a long time they have been in a state of repose or rest. They are most sensitive to the action of radium or X-rays when they have been in a state of mitosis or indirect cell division. On account of the double alternating phenomenon of cell reproductive activity Regaud reasons that a short irradiation will destroy only those cells which at the moment are in a state of their maximal radiosensitivity. It spares the others. On the contrary a longer irradiation for several days destroys all the mother cells successively, because, as the cycle of cellular renovation continues, each cell passes at some time into the phase of maximal sensitivity.

Regaud believes that the majority of epidermoid carcinomas are not more radioresistant than the epidermis from which they are derived. For the most part the cancers are less radioresistant. The dosage for sterilization of cancers of the lip, mouth, and pharynx is from 70 to 100 per cent. of the epidermicidal dose. The radiosensitivity of intra-oral cancers is diminished by infection. This is particularly dangerous in the infra-lingual region. Immunization or radio-vaccination of the neoplasm results in acquired radioresistance from the administration of improperly repeated and spaced irradiations.

The predominance of cells of the basal type, forming many layers or superimposed strata, is a character which indicates radiosensitivity. Per contra, the predominance of polyhedral cells of the same type as the cells of the malpighian layer of the normal cutaneous epidermis indicates relatively feeble radiosensitivity, as these cells are usually in the evolutionary course of keratinization. In general it may be said of the radiosensitivity of epidermoid carcinomas that differentiation of the cutaneous type coincides ordinarily with feeble radiosensitivity, whereas the type mucosæ of the same relative degree of differentiation is more highly radiosensitive.

The General Principles of Intra-oral Radium Therapy.—In America the dosage of radium is expressed in terms of "milligram hours" or "millicurie hours", which is a constant value, being the dose of emission. It is easily computed by multiplying the intensity of the radiation (i.e., quantity; milligrams of radium or millicuries of radium emanation utilized) by the duration in hours of the application. The dosage notation used throughout France makes the dose proportional to the quantity of radium destroyed during the course of its application. This notation (Debierne and Regaud, 1914; Regaud and Ferroux, 1919) is preferable because it is commodious and equally applicable to tubes of radium or of radon. Let us assume that the total therapeutic value of one millicurie of radium emanation is 133 millicurie hours. Therefore, one millicurie destroyed is the equivalent of 133 millicurie hours or of 133 milligram hours. Or one milligram of radium

2

acting for 133 hours may be expressed in terms of dosage as one millicurie destroyed.

Before treatment is started the teeth are thoroughly cleansed, the necessary dental extractions are performed and pyorrhœa treated. During the course of treatment the mouth is cleansed by daily irrigations with saline or potassium permanganate solution. While radio-active foci are within the mouth, gauze is interposed between the teeth, tongue and cheek for the purpose of avoiding the influence of secondary radiations given off by the teeth.

The hollow needles employed for interstitial curietherapy (radium therapy) are of platinum-iridium, and are charged with emanation throughout their entire length. They are 2.7 and 3.5 centimetres long, 1.5 centimetres thick and have a filtration strength of 0.5 millimetre of platinum. The true focus, *i.e.*, the length occupied by the gas radon, is usually three centimetres long in the longer needle. This gives a cylinder of irradiated tissue rather than a sphere, such as occurs with the use of radon seeds. The maximum amount of emanation in each needle should be not more than two millicuries; sometimes more is used.

Under regional anæsthesia the needles are introduced into the tongue and completely buried there. Each needle has a double eye; the lower eye is for suturing the needle with silk thread to the neighboring lingual tissue; the upper eye is for external anchorage by means of a heavy thread, which passes out of the mouth. It is important that the buried needles are parallel with each other. Furthermore, the needles must be a distance of one centimetre or more apart from each other in order to prevent possible necrosis from too heavy radiation and from secondary rays flying from adjacent needles.

Ordinarily, about as many platinum tubes of emanation are employed in the treatment of the tongue cancer as there are millicuries destroyed in the total dose, e.g., if the total dose is to be sixteen millicuries destroyed, then sixteen needles having one tube of emanation each are used. Occasionally, when the needles are long, some of them contain two tubes of emanation, in which case correspondingly fewer needles are used. In order to obtain the required dosage these needles must sometimes remain in situ for as long as five days. The maximal quantity of desirable irradiation is approximately one hundred millicurie hours per cubic centimetre of tissue. This is sufficient to produce a radium reaction of the tissues, but not enough to induce radio-necrosis.

Some patients who are suffering from very advanced cancers and for whom even a local or partial healing is not to be expected can be helped by radium therapy. In such an instance one cannot safely use the same rules as when a less advanced state of the disease permits an attempt at curative therapy. In the intentionally palliative treatments the therapist abstains from large doses and prefers moderate successive irradiations to a single intense one.

Regaud's principles in the treatment of lingual malignant disease are:

INTRA-ORAL CANCERS AT THE UNIVERSITY OF PARIS

- 1. To distribute numerous and weak radio-active foci in the whole cancerized part and immediately around, having the care to create a radiation field as homogeneous as possible;
 - 2. To use the gamma rays only in order to avoid a necrotizing effect;
- 3. To give a continuous irradiation for a long time, reducing thus both the intensity and the dose;
- 4. To expect success from but a single treatment, in order to avoid autoimmunization of the neoplasm against the radiations.

The principal causes of failure in this method of radium puncture of the tongue are recited by Regaud as follows:

- 1. A too narrow estimation of the cancerized place;
- 2. The want of accuracy, especially in the places difficult to reach (e.g., in the pharyngeal part of the tongue);
- 3. An insufficient global (total) dose, or too much inequality in dealing out of the dose given out by the different needles;
 - 4. An imperfect material of the needles;
 - 5. Radio-necrotic accidents.

According to Regaud, radio-necrosis is caused by:

- 1. The excess of the global (total) dose;
- 2. The excess of the dose in a limited area, resulting from a few needles being wrongly placed;
 - 3. The repetition of the treatments;
 - 4. A too weak screening;
- 5. The simultaneous association of radium puncture and of strong irradiation from an external source.
- (a) Dorso-lingual Anterior Cancers.—By virtue of their accessible location and anatomy these cancers are easy to treat by the previously mentioned procedures. Radium puncture or interstitial irradiation is superior to the surgical extirpation of such cancers. The very small ulcerations of the tongue, of which the clinical diagnosis is uncertain and of which biopsy is practically equivalent to the total removal, are left to surgery. If the lingual cancer is operable and a previous attempt to cure it by radium therapy has failed, then the tongue should be amputated, because a second treatment by radium is less efficacious than the first, a third one less than the second, and so on. When the tongue is covered with multiple leucoplakia tending to undergo malignant degeneration, amputation is preferred to decortication.
- (b) Dorso-lingual Posterior Cancers.—These cancers are difficult to treat by interstitial irradiation because of their position; this same handicap obtains for surgery even when the cancers in this location are small. Some of these lesions descend very deeply into the pharynx and are poorly treated by radium puncture alone; some of the cancer cells frequently remain viable if not unscathed, hence supplementary external irradiation at a distance should be given over the superior part of the neck,
- (c) Cancers of the Infra-lingual Area and Floor of the Mouth.—Even when tiny, cancers of this region are seldom removed successfully by surgical

means. In recognition of this the technic at the Radium Institute has been to apply topical or surface irradiation to the superficial carcinomas of the floor of the mouth anteriorly. In suitable cases with little infiltration an apparatus in the nature of a wax moulage is moulded directly and applied to the floor of the mouth; during this procedure the tongue is protected by a lead sheet. Radium puncture of the floor of the mouth frequently causes radium necrosis; another dangerous complication is the occasional development of phlegmonous inflammation of this area. In those infra-lingual cancers where a progressive cancerous infiltration into the deep muscles of the tongue occurs, an intrabuccal moulage would be insufficient; in such an event, interstitial irradiation of the infiltrating tumor must be performed.

Interstitial irradiation is carefully avoided when the carcinoma involves the mucous membrane covering the inferior maxilla. Such a region is treated by the application of radium on a mould, or, if this is unsuccessful, the maxilla is resected and the site later irradiated by external radium therapy (curietherapy) at a distance.

After the direct irradiation of the floor of the mouth has been completed, a wax moulage is adapted to fit under the chin (submental area). The focal distance from radium to skin is 2.5 to 4 centimetres, in inverse ratio to the depth of infiltration of the cancer. The filtration is one millimetre of platinum. It is important to observe that the submental irradiation is never given until the intra-oral irradiation has been completed. The reason is that secondary radiation from the intra-orally disposed platinum capsules and lead protection sheets may induce radio-necrosis. The irradiation of the supra-hyoidal region through the neck is useful, not only on account of the frequency of lymph-node contamination but also to fulfill a cross-fired irradiation of the internal primary lesion. If lymph nodes are already palpable, the irradiation is preceded by surgical extirpation of such lymph nodes.

Example of Management of an Infra-lingual Cancer (Treatment by Doctor O. Monod).—A papillary tumor was found on the anterior floor of the mouth at the junction of the tongue and buccal floor. Inasmuch as it was not deeply indurated, Doctor Monod made a wax mould to fit in the floor of the mouth under the tongue. The focal distance was obtained by the intervention of one centimetre of wax. The filtration was 0.5 millimetre of platinum. To obtain this, the wax moulage was studded with several tubes of radium element, each of 3.33 milligrams, giving off 25 microcuries destroyed hourly.

The area to be treated equals seven square centimetres. Dosage, at one millicurie destroyed per square centimetre: $7 \times 1 = 7$ millicuries destroyed. The radium employed consists of six tubes of 3.33 milligrams strength: $6 \times 25 = 150$ microcuries destroyed hourly. Irradiation for eight hours daily: $8 \times 150 = 1200$ micro- or 1.2 millicuries destroyed daily. The total time: 7 millicuries destroyed \div 1.2 millicuries destroyed = 5 days and $6\frac{1}{2}$ hours.

After the intra-oral treatment was completed a wax moulage was made of the submental area. The focal skin distance was four centimetres. The filtration was one millimetre of platinum. The total skin area irradiated was 132 square centimetres. The total dosage was 300 millicuries destroyed (40,000 millicurie hours). The dose per square centimetre of surface was 2.19 millicuries destroyed. The time of treatment was

INTRA-ORAL CANCERS AT THE UNIVERSITY OF PARIS

for ten days of eight hours daily. The amount of radium employed was fourteen tubes giving 100 microcuries destroyed hourly, and forty-nine tubes giving fifty microcuries destroyed hourly.

Cervical Lymphadenopathics.—The frequency and promptitude of invasion of the cervical lymph nodes occur in the following order of ascendancy: dorso-lingual anterior cancers < dorso-lingual posterior cancers < infralingual cancers. Cancerous lymphadenopathies follow cancers of the lingual and sublingual areas with greater frequency than obtains for labial cancers. The infiltrating carcinomas are more precocious in their metastases than the papillary types. The lymph nodes involved from cancers of the tongue are not as easily perceived as those from the lip; the former occur deeply and nearly always in the submaxillary region or under the sternocleidomastoid muscle and in contact with the great vessels of the neck. In infra-lingual cancers the submaxillary lymph nodes are usually the first relay. The invasion of the carotidian lymph nodes alone, with the submaxillary nodes remaining free, is very rare in the infra-lingual cancers. It is a frequent finding in cancers of the dorso-lingual anterior area and is even more common accompanying those cancers of the dorso-lingual posterior region.

Very small primary lingual cancers (posterior, especially) are sometimes accompanied by relatively massive cervical lymphadenopathies; indeed the primary lesion may be so small as to escape immediate suspicion or detection by the patient and clinician.

The customary procedures in the management of these cancerous adenopathies at the Radium Institute are as follows: If there are palpable adenopathies in the neck, they are not molested until after the radium reaction in the tongue has sufficiently subsided (a period of about three weeks). Then a unilateral complete block dissection of all the cervical lymphoid tissue is performed; very seldom are both sides subjected to operation. Every lymph gland is examined histologically; if found to contain carcinoma, the neck is irradiated by radium therapy at a distance. If no microscopic evidence of carcinoma is discovered in the excised lymphoid tissue (i.e., if it be inflammatory only), then the neck is not irradiated, but careful watch is observed.

If there are no palpable lymphadenopathies after irradiation of the tongue, the procedure is sometimes different. If the patient lives in the provinces and cannot be watched closely, the neck dissection may be carried out prophylactically, the excised lymphoid tissue examined microscopically and the neck irradiated, depending on the positive findings. But if the patient is accessible and can be seen frequently the neck is left alone and the policy of watchful waiting pursued. If adenopathic enlargements appear later, they are dealt with as explained above.

Neck Dissections.—At the Radium Institute neck dissections are not performed when the general state of the patient is bad, when the lingual cancer is very tiny, when there are no perceptible adenopathies in patients who are under constant surveillance, and when the cervical lymph nodes are voluminous and so fixed as to render surgical removal dangerous to the patient.

The last contraindication is not an absolute one. When the lymphade-nopathies are too adherent to be totally and correctly removed (*i.e.*, when the knife cannot pass outside the tumor mass without opening it), Professor Regaud believes it worth while at times to remove surgically the greatest part of the tumor, because its large size is one of the contributory factors in the failure of radium therapy. External curietherapy (radium) always follows the surgical act.

Crile's operative technic with local anæsthesia is followed. If the intraoral lesion is unilateral, usually the neck dissection need be done only on the side corresponding. When done unilaterally, the sternomastoid muscle and internal jugular vein are practically always removed. If the primary cancer is on the anterior tip of the tongue, or on the anterior floor of the mouth, or on the lower lip in the mid-line, or in the presence of bilateral cancerous adenopathies from any intra-oral source, the radical neck dissection is carried out only on the side of the neck most involved; on the opposite side the lymph nodes only are extirpated.

Irradiation of the Neck.—It has been asserted that the secondary or metastatic cancer growth of epidermoid carcinoma in lymph nodes is less radiosensitive than the primary lesion. Regaud agrees that these cancerous nodes are more difficult to cure. But by a comparison of the true sensitivity of these localizations (which is measured by the dose necessary for the sterilization per unit of volume, all the other factors remaining the same), Regaud has explained and demonstrated that there is no appreciable difference between the primary lesion and the secondary growth in the lymph nodes.

After a survey of the percentage of cured patients at the Radium Institute, where the cervical lymph nodes have contained microscopically evident cancer, the authorities agree that post-operative curietherapy has increased the efficiency of the surgical dissection. However, the treatment of cancerous submaxillary and carotidian lymphadenopathies by the application of radium at a distance is not as successful as transpelvic radium therapy for cancer of the uterus, because in the neck there is only one area or "champ" for irradiation of each side.

Doctor Coutard's factors for the X-ray treatment of pharyngeal and posterior lingual cancers with cervical metastases are: kilovolts, 200; anticathode skin distance, 40 to 60 centimetres; filtration, 1.5 to 2.0 millimetres of zinc plus (+) 3 millimetres of aluminum; the cutaneous portal of entry, 50 to 150 square centimetres with an occasional supplementary buccal portal of entry. The results are not as good as when interstitial irradiation is used in the primary lesion, because the coefficient of intensity of the X-rays in the neoplasm proper is usually only one-fourth or one-fifth of the epidermicidal dose. Satisfactory results with the X-ray are generally not attained in the depths without destruction of the cutaneous epithelium of the surface (a temporary elective radio-epidermitis). The entire dosage is consummated in less than three weeks. The X-ray alone does not cure adenopathies following epidermoid carcinomas of the cutaneous type of evolution, according to Doctor Regaud.

INTRA-ORAL CANCERS AT THE UNIVERSITY OF PARIS

External radium therapy at a distance (curietherapy) is the method of choice for irradiation of the neck at the Radium Institute. A wax case or moulage is made for each patient's neck. After it has been used it is labelled and stored for possible future use if the patient ever needs retreatment. The wax is the preparation of Drs. O. Monod, A. Esguerra and G. Richard. Its formula of composition is:

 1. Cire d' abeille pure (pure beeswax)
 100 grams

 2. Paraffine fusible at 62° C.
 100 grams

 3. Sciure de bois finement tamisee (finely sifted sawdust)
 20 grams

The sawdust greatly diminishes the weight of the apparatus. When the mixture cools in sheets one centimetre thick the sawdust layer sinks to the bottom; it is this side which is placed next to the skin, because the waxy part softens too readily. The gamma rays are easily diffused through this material, which has about the same absorption coefficient as the skin. The composite wax can be softened easily in hot water at 48° C. It can be sterilized at 120° C. and used again.

From 500 to 750 milligrams of radium, having a filtration of one millimetre of platinum, are placed seven centimetres from the lateral surface of the neck. Distance is obtained by a box-like wax moulage, which is lined with lead plate four millimetres in thickness. The lateral cervical area to be irradiated is marked out rectangularly with an indelible pencil. sheet of wax while soft is moulded to the corresponding neck, shoulder and side of the head. On the external surface of this wax is marked an area corresponding to the one delineated on the skin. The four millimetre lead sheet, twelve centimetres high to prevent lateral radiation, is folded to make a four-sided lead wall, which is trimmed to fit over the marked area on the wax. Now without this lead box, molten wax is moulded to give it support and to fasten it to the wax moulage of the head, neck and shoulder. Within the lead-lined cavity and upon its wax floor are placed upright cork blocks. five centimetres high, and upon these as legs is applied another layer of wax, which fits within the lead rectangle. Over this top layer of wax are distributed the radium tubes. The radium is, therefore, seven centimetres from the skin surface. One side of the neck receives about 500 millicuries destroyed, which is the equivalent of 66,500 millicurie or milligram hours of irradiation. This would mean a surface dose of approximately three and one-half millicuries destroyed for every square centimetre of skin surface. If both sides of the neck (right and left anterolateral) are to be irradiated, the full amount of 500 millicuries destroyed is not used on each side. The box is worn from eight to twelve hours daily, depending on the amount of radium available, and the treatment is extended over ten to twelve days.

External and bilateral curietherapy and röntgenotherapy of the superior part of the neck frequently produces a disagreeable but temporary radio-epithelitis not only of the mouth but also of the pharynx. This causes dysphagia and temporary hypo-alimentation, sometimes broncho-pulmonary infection. In irradiating the neck it should be remembered that the mucosa

of the pharynx, larynx and œsophagus are especially predisposed to radionecrosis. Necrosis of the inferior maxilla is prevented by the extraction of all loose, infected teeth, and the disinfection of the buccal cavity.

Doctor Regaud has not persevered in the practice of transcutaneous radium puncture of the lymph glands of the neck, nor of radium-surgery (i.e., of putting radio-active foci in the lymph nodes after exposure by a surgical incision), because these two technical procedures have not given good enough results. However, the transcutaneous radium-puncture form of interstitial irradiation, accomplished with radium needles, is sometimes used in submaxillary and submental nodes, when they are very large and fixed to the deep tissues and to the skin. Radium puncture for carcinomatous cervical adenopathies is dangerous in the carotid region because of the proximity of the large blood vessels. Alone, radium puncture is insufficient, but completed or followed by irradiation from a distance, this type of interstitial radium therapy offers valuable services for these voluminous nodes, easily accessible but inextirpable. Regaud has warned radium therapists that curietherapy by external foci must never be practiced together with radium puncture, because of radio-necrosis which may result from secondary radiation arising from the heavy metal of the needles.

Cancers of the Lip.—Lip cancers receive irradiation from three sides by the surface application of a wax moulage in whose superior surface the radium tubes are implanted. The wax is the same as that previously described; it is superior to dental modelling compound, which sometimes gives off secondary radiations. The focal distance is only 0.7 centimetre from the lesion, which distance is obtained by the thickness of the intervening wax. The filter used is 0.5 millimetre of platinum. Radium element is employed. The platinum tubes used to attain the correct dosage are of such a radium content that they each give off either twenty-five or fifteen microcuries destroyed hourly, e.g., the tube containing 3.33 milligrams of radium \approx twenty-five microcuries destroyed hourly. The dosage of irradiation is 0.7 millicurie destroyed (93.1 millicurie hours) for every square centimetre of tissue. This is not given continuously; about eight hours daily for six to seven days are needed to give the total and correct dosage.

Lymphadenopathies from Lip Cancers.—In the case of labial cancer where no palpable lymph nodes exist, examinations of the neck are made preferably by the same doctor who treated the lip. The patient is examined every two months during the first six months, then every three months until the end of the second year, then two times during the third year. If palpable adenopathies are present, the management is the same as previously described. Post-operative curietherapy is again preferred to röntgenotherapy.

REFERENCES

¹ Regaud, Cl., Lacassagne, A., Roux-Berger, J., Coutard, H., Monod, O., Pierquin, J., et Richard, G.: Les adénopathies consécutives aux cancers des lèvres, de la langue et du plancher de la bouche; leurs indications thérapeutiques; leur traitement. Paris Médical, No. 16, pp. 357-372, April 16, 1927.

INTRA-ORAL CANCERS AT THE UNIVERSITY OF PARIS

- Regaud, Cl.: Sur la curiethérapie des épitheliomas de la langue et de leurs adénopathies secondaires. Ler Congrès internat. Radiol. Londres. Brit. Jour. Radiol., B.I.R. Section, vol. xxx, No. 303, p. 361, 1925; Jour. de Radiol., vol. x, No. 2, p. 49, 1926.
- ³ Regaud, Cl.: Principes du traitement des épitheliomas épidermoides par les radiations. Application aux épidermoides, de la peau et de la bouche. Congrès du cancer, Strasbourg, vol. i, rapports, p. 168; vol. ii, discussions, p. 162; et Jour. de Radiol., vol. vii, p. 297, 1923.
- ⁴ Regaud, Cl., Jolly J., Lacassagne, A., Roux-Berger, J. L., Cesbron, H., Coutard, H., Monod, O., et Richard, G.: Sur le traitement des cancers deslèvres par les rayons X et le radium. Bull. Assoc. franç et du cancer, p. 321, juillet, 1921.
- ⁵ Ferroux, R., et Bruzau, M.: Principes et dispositifs de la curiethérapie extérieure à distance. Communication à l'occasion du Cours de perfectionnement sur le cancer, sous presse, dans Strasbourg médical, 1927.
- ⁶ Esguerra, A., Monod, O., et Richards, G.: (a) Généralites sur l'emploi des substances plastiques en curiethérapie de surface. Journ. de Radiol. et d'electrol., vol. vi, No. 7, p. 331, 1922; (b) Préparation des pièces plastiques destinées à la curiethérapie de diverses régions de la tête et de la partie supérieure du cou. *Ibid*, vol. vii, No. 2, p. 49, 1923.

TREATMENT OF ACUTE POST-OPERATIVE THYROID TOXÆMIA*

BY ARTHUR S. McQuillan, M.D.

OF NEW YORK, N. Y.

It is a fact that since the proper use of iodine in preparing cases for thyroid surgery the incidence and severity of this dreaded toxæmia have lessened. It is also a matter of common occurrence that not a few cases of Graves's disease, for unknown reasons, do not respond to iodine treatment in the usual way by a temporary improvement and subsidence of symptoms. It has often been pointed out that the greatest benefit from iodine in these cases, preparatory to surgery, comes after its use for a brief period of ten to fourteen days; that with further use of this drug in moderately large doses the previous symptoms not only return, but may be intensified; that surgery should be undertaken at the end of this brief period, as at this time the benefit from the proper use of iodine is maximum, but temporary. In spite of this latter, cases are constantly coming to thyroid surgery after having had iodine treatment for months and often years. Possibly for these reasons, the incidence of post-operative thyroid toxæmia is still a matter of concern and is entitled to further consideration in the way of treatment.

This toxemia is generally of two types; one being acute, occurring suddenly and without warning, even during operation and within a twenty-fourto forty-eight-hour period post-operative. It is characterized by a rapid and increasing pulse rate, with lessened volume, a moderate rise in temperature, extreme chorea-like mental and physical restlessness, marked pallor, dry tongue, vomiting, diarrheea and often a peculiar dyspneea in which the breathing is slow and sighing and there is a complaint of oppression on chest and inability to take a deep and satisfactory breath. Usually the urine shows the presence of acetone. The whole picture often resembles that of insulin shock. Death may occur suddenly at any time during the progress of this group of symptoms. Less often one sees a subacute type in which the pulse rate and temperature rise more gradually and with fluctuation periods over a week or ten days. There may be periods of restlessness, but it is overshadowed by stupor. Nausea and vomiting are common, and pharyngeal paralysis of varying degree is occasionally seen. This subacute type often resembles the picture of uraemia and is more resistant to treatment. There is no sign or symptom which will foretell this toxemia, and it is well known that the condition may follow surgery in a patient whose pre-operative thyrotoxicosis is mild as well as in one with a severe type.

There is good reason to believe that this post-operative toxæmia is not an exacerbation of the preëxisting thyrotoxicosis occurring post-operatively.

^{*} Read before the Surgical Section of the New York Academy of Medicine, January 4, 1929.

In the first place the symptom-complex in the acute toxæmia is different from that seen in a pre-operative crisis. It is true that the subacute may resemble in its symptom group that seen in the final and severe stages of a chronic hyperthyroidism, lasting over many years; but in the latter the thyroid gland shows predominant pathology of destruction or exhaustion atrophy rather than hyperplasia which is the feature of Graves.² It is difficult to understand how this toxemia can be due to too much of a normal thyroid secretion, or even to too much of an abnormal thyroid secretion, when it occurs most often following a subtotal thyroidectomy with the remains of but a small amount of thyroid tissue, and the function of this presumably much impaired, temporarily at least, following the necessary trauma of a most careful and gentle operative procedure; and especially when post-mortem examination shows the remaining thyroid tissue with alveoli lacking colloid and instead filled with disintegrating cells and cell detritus, in other words destruction predominant.3 As a matter of fact, in my experience unnecessary trauma during operative procedure predisposes to this condition. All points to a possible fact that the patient perishes from a sudden and complete absence of thyroid hormone, rather than too much of it. Very occasionally this toxamia has been reported following a single or double ligation of the superior thyroid vessels in an extremely thyrotoxic patient. It is apparent that such a condition is hard to explain on a lack of thyroid hormone basis, but with the function of this gland so bound up with that of the involuntary nervous system, it is reasonable to believe that a temporary acute suppression of function could take place which has its analogy in the function of other organs.

The intravenous administration of iodine has gained some repute in the treatment of this condition. The results vary in different cases and with different workers. In my experience it has not usually been of value and surely not as reliable as some other remedies. It is not clear how iodine can be of benefit, if to be of benefit, it must be metabolized into a useful product by thyroid tissue, whose cells are presumably at least temporarily damaged, functionally or even structurally.

It is a common observation that glucose helps this condition. It usually improves the nausea, vomiting, and restlessness.⁴ There is much to make one believe that sugar is an important food for the central nervous system, which controls the storing up and dissipation of energy, this latter being so closely associated with thyroid function, which in turn has a definite relation to sugar metabolism. Thyroid feeding increases the circulating blood sugar. In hyperthyroidism the circulating blood sugar is increased and thyroid feeding increases it still more. Partial thyroidectomy decreases glycosuria.⁵ Hence it would seem that thyroid feeding should make sugar more available for the half starved nervous system in this toxæmia, and especially since evidence points to a lack of thyroid hormone in this condition.

A good preparation should be indicated in this condition. Rogers ⁶ and Santee ⁷ have reported cases of post-operative thyroid toxæmia strikingly benefited by the subcutaneous and intravenous administration of a liquid

ARTHUR S. McQUILLAN

thyroid preparation called Thyroid Residue. This latter is a filtrate containing non-coagulable thyroid substance, and is that which remains after the minced pig thyroid gland has been extracted with normal saline, salted out to remove globulins, acidified and boiled to remove the acid albumens, made alkaline and boiled to remove the alkali albumens. This filtrate slightly alkaline and concentrated to contain a definite amount of iodine per cubic centimetre has been called Thyroid Residue, and experimentally is capable of raising the circulating blood sugar and stimulating the vagus group of the autonomic nervous system.⁸ This latter action would tend to slow the pulse rate rather than accelerate it. The benefits described have been a reduced pulse rate and temperature, an amelioration of restlessness, delirium, nausea, and vomiting.

In support of these observations, I can report several cases in which there was much benefit from the subcutaneous administration of this thyroid preparation. In some few cases of my series it has had no effect, but in the majority it has been of much value. This preparation undoubtedly represents only a fraction of the complete thyroid hormone. It should be mentioned that thyroxin is valueless in this toxemia due to its slowness of action.

In the chart records there is seen an immediate and definite improvement in the rate of pulse and rise of temperature in these cases, but another very suggestive observation is that the effect of a single dose of this thyroid is but temporary; when it is used up so to speak, the previous toxic state recurs and can again be benefited by another dose of thyroid. In these cases it would seem that repeated doses of thyroid, the effect of which is but temporary, are necessary until the remaining thyroid tissue recovers enough to support the patient. Both Rogers' and Santee's cases confirm this latter observation.

Note.—In connection with this paper there were presented records of nine cases, which illustrated the points made by the author.

BIBLIOGRAPHY

- ¹ Thompson Brailley and Thompson: The Effective Range of Iodine Dosage in Exophthalmic Goitre. Jour. Amer. Med. Assn., vol. xci, No. 22, p. 1719.
- ² Marine: Pathological Anatomy of Thyroid Gland. Endocrinology and Metabolism.
- ² Rogers: Medical Journal and Record, August 3, 1927.
- Rogers: ibidem.
 - Goetsch and Browder: N. Y. State Journal of Medicine, October, 1922.
- 5 Rogers: ibidem.
 - Hancher, Hupper, Blau and Rogers: American Journal Physiology, vol. 1xxv, No. 1, December, 1925.
- 6 Rogers: Medical Journal and Record, August 3, 1927. Surgery, Gynæcology and Obstetrics, April, 1926.
- Santee: Transactions of New York Surgical Society, Annals of Surgery, vol. 1xxxv, pp. 605-607, April, 1927.
- ⁸ Rogers, Rahe, Alblahadian: American Journal Physiology, vol. xlviii, No. 1, February, 1010.

FIBROSARCOMA OF THE THYROID

By WILLIAM O. JOHNSON, M.D.

OF LOUISVILLE, KENTUCKY

Opinions have varied in the past regarding the frequency with which sarcoma of the thyroid occurs, due in part, no doubt, to the difficulty of distinguishing clearly between sarcoma and carcinoma of the thyroid.

Ewing ¹ states that the occurrence in man of true sarcoma of the thyroid still requires demonstration. Ewald ² reports that the occurrence of sarcoma of the thyroid is in proportion of one to three with carcinoma of the thyroid, while Crotti ³ states that the fibrosarcoma are the most frequently discovered and the least malignant of thyroid tumors, a statement indicating a relative frequency of the disease not in accord with the reports of others. Other writers in most instances report spindle cells or mixed spindle- and round-cell sarcoma as most common, but only occasional cases of round-cell and fibrosarcoma have been found in the literature.

The age incidence, clinical course, and gross appearance, together with the modes of metastasis of the sarcomata, are so similar to those of the carcinoma of the thyroid that distinct lines of differentiation between the two do not exist. In some cases the differentiation can only be made by the histological picture, but in tumors of the thyroid we know that this method is no absolute criterion.

Graham ⁴ states that only 30 to 40 per cent. of the cases of malignancies of the thyroid can be diagnosed from cell tissue morphology, but when other symptoms and findings are taken into consideration, along with miscroscopic examination, the diagnosis may be established.

Under the above conditions it is easily conceivable, by those who hold the view that the reported sarcoma of the thyroid are only rapidly growing, undifferentiated carcinoma, that, unless the cells are closely studied with special stains, in most instances it is difficult to differentiate sarcoma from carcinoma of the thyroid.

In reviewing the literature we are impressed with the looseness, with which the early diagnosis of the thyroid sarcoma was made. Although tumors of the thyroid have long been known, it was not until 1879 that Alibert ⁵ reported a case of sarcoma of the thyroid. Following this there were a few scattered cases reported, neither well detailed nor accurate in description, until in 1879 Kaufman ⁶ reported a series of malignant thyroidal tumors. Müller and Speece ⁷, in 1906, present the most inclusive summary of the literature, giving Ehrhardt's ⁸ report of 150 cases, together with their collected cases. Langhans, in 1907, presents an important pathological contribution to the malignancies of the thyroid, a subject which was well summarized by Bauman ⁹ in 1920. Wilson, ¹⁰ in 1921, published a

WILLIAM O. JOHNSON

report of the thyroid malignancies in the Mayo Clinic from 1901 to 1921. In a very comprehensive way he reviews both the literature and the subject as a whole, presenting photomicrographs, and discussing the characteristic types of malignancies of the thyroid. The above papers have so inclusively presented the subject that a recapitulation here would be superfluous. Eberts and Fitzgerald ¹¹ published a paper in 1927, since which time there has been no outstanding report on malignancies of the thyroid. They present an analysis of cases of malignancies of the thyroid gland seen at the Montreal General Hospital, together with a summary of the literature to date. In



Fig. 1.—Case I. Note displacement of larynx to right,

this series of 1876 cases of malignancies of the thyroid cases of sarcoma are included. They state that if sarcoma does exist, it is certainly the most deadly of the histological varieties of malignant diseases, and patients rarely survive over four months. According to their observations the sarcoma seems to be less radiosensitive than other forms of malignant neoplasia of thyroid origin.

The highly functioning and greatly predominating epithelial structure of the thyroid gland is such that the natural predominance should be in favor of epithelial growths, and since the thyroid contains in its stroma con-

siderable connective tissue, there is undoubtedly a possibility of the development of sarcoma. De Quervain 12 has stated that all forms of sarcoma do occur in the thyroid, and this statement, by such an authority, should be given proper consideration; yet, with all the cases reported to date no conclusive facts have been reached, and the question of the existence of sarcoma of the thyroid remains unsettled.

Just as indefinite as is their actual existence is the mode of treatment of these malignant growths. The most practical viewpoint seems to be expressed by Wilson ¹⁰, when he writes: "Early, thorough operations give a fair percentage of cures; palliative operations in late cases with extensive local involvement are warranted." Not only do I agree with this, but in addition I believe that both X-ray and radium should be given to the fullest extent for the area involved, so as to insure every possible chance of recovery, for in some instances the results are most gratifying.

We wish to present two cases of malignant growths of the thyroid which we believe can be classified under the heading of sarcoma, for the charac-

FIBROSARCOMA OF THE THYROID

teristics of the growths, together with their history, gross and histological pictures, rapidity of recurrence and end results, justify this diagnosis.

Through the courtesy of Dr. Wm. E. Fallis, of Louisville, Ky., I was permitted to see the following case:

Case I.—Male, sixty years of age, was first seen June 21, 1928. His chief complaint was swelling of the left side of his neck with hoarseness. He had noticed a small mass on the left side of his neck for eighteen years or more. This has caused him no trouble. He had otherwise been perfectly well. About three months ago this mass in the neck

began gradually to enlarge. During this period he has lost twenty-five pounds in weight, accompanied with progressive weakness and nervousness. During the past six weeks the growth has grown more rapidly. Associated with this there has been an increasing hoarseness, shortness of breath, and difficulty in swallowing, so that for the past two weeks he has been unable to swallow solid foods. He had a constant feeling of pressure in his neck, which is worse when head is turned to left, occasional headaches, appetite good, sleep disturbed, occasional nocturia, otherwise negative.

He was a well developed and nourished man; temperature 99°, pulse 80, good character.

There was a marked enlargement on the left side of the neck. (Fig. 1.) Mass about the size of a grapefruit, which pushes the trachea to

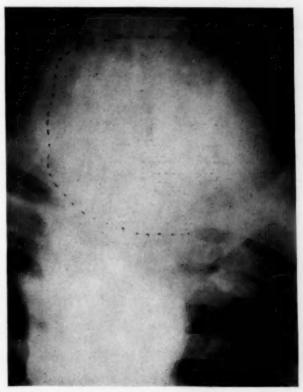


Fig. 2.-X-ray of chest showing size of tumor.

the right about one and one-half inches. The skin of the neck is rather hyperæmic, but vessels are not prominent for the size of mass, no bruits or thrills. The mass is firm, fairly freely movable laterally or up and down, but seems loosely attached in the region of the trachea. The right carotid is palpable posteriorly to the mass; no definite glands can be made out in the lateral triangles of the neck. The mass seems to be definitely circumscribed and can be felt posteriorly to the trachea on the right side, but does not seem to extend beyond the mid-line of the trachea anteriorly, and extends beneath the clavicle on the left side.

An X-ray film of the chest shows the right lung clear throughout. The left lung shows a substernal mass extending well below the lower margin of the clavicle. No evidence of metastasis made out in field. (Fig. 2.)

Laryngeal examination by Doctor Maupin showed laryngeal œdema and congestion with partial immobilization of cords suggestive of malignancy.

WILLIAM O. JOHNSON

June 26, 1928, I excised the growth with the left lobe of the thyroid under novocain local block, wound drained with gauze. (Fig. 3.)

Pathological Report.—Specimen consists of four portions of thyroid tissue varying from forty-five to eighty millimetres in their greatest diameters. Largest portion is a dull yellowish-gray, with a rim of dark red, lobulated thyroid tissue measuring fifty by thirty millimetres on one surface. The remainder of the tissue is nodular, fairly firm and has a pale yellowish, mottled cut surface. At pole there is a discrete encapsulated firm nodule measuring fifty-five millimetres in greatest diameter. (Fig. 4.)

Microscopic Description.—Sections show a rather cellular tumor made up of rounded,

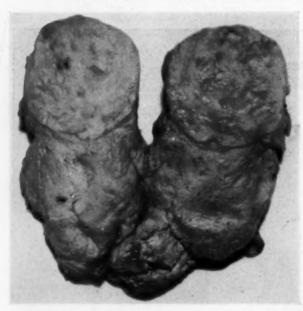


Fig. 3.—Tumor divided longitudinally. Note adenoma in upper

oval and polyhedral-shaped cells with fairly abundant cytoplasm and round or oval vesicular nucleus. Stroma is scanty, consisting of blood vessels supported by a delicate reticulum. Section through thyroid tissue shows replacement of thyroid by tumor growth. Cells vary greatly in size ranging from ten to sixty-five microns in their greatest diameters. Cytoplasm stains acidophilic and is fairly homogeneous with distinct fine granules and vacuoles present. Many of the cells have an elongated side suggesting a unipolar arrangement and resemble somewhat a ganglion cell. Nucleus is vesicular and distinct dense staining, round nucleolus. In some nuclei the chromatin stains deeply. Only

rarely is a mitotic figure found. Few cells are multinucleated. Most of the nuclei are eccentrically located. Gross and Microscopic Diagnosis.—Fibrosarcoma.

The patient was discharged from the hospital July 2, 1928, in satisfactory general condition. Voice improved, able to swallow solid foods. Slight serous drainage from the wound. Patient returned home and gained in weight. Progressed satisfactorily for a period of two weeks, when the growth began to reappear. Growing quite rapidly, with symptoms similar to the condition before operation. August 4 to August 9, 1928, daily deep X-ray treatments were given, except for August 7, 1928, when two were given by Dr. D. Y. Keith, of Louisville, Ky. Technic, fifteen-inch spark gap, total forty minutes with twenty milliamperes, using one millimetre copper-aluminum filter with 170 kilo volts. Patient returned home, but did not progress satisfactorily and on August 19, 1928, returned for further operative efforts.

August 21 I excised the recurrent growth from the left side of the neck. One hundred and forty milligrams of radium in four tubes were placed in the tumor bed for ten hours. Filter, one millimetre rubber, one millimetre brass.

The specimen consisted of an oval, irregularly-shaped mass of tissue measuring one hundred and thirty by eighty by seventy-five millimetres. It has a smooth, indistinct capsule in some areas and in others the tissue is ragged. A large blood vessel is surrounded by the tumor mass. Cut surface shows a pale yellowish-gray, lustreless tissue which is somewhat homogeneous except for scattered areas of necrosis and focal areas of hæmorrhage. (Fig. 5.)



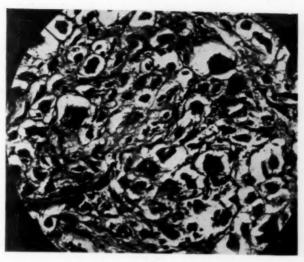
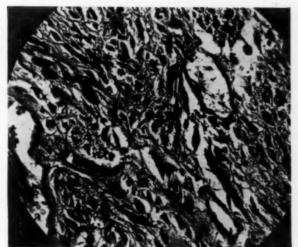


Fig. 5.—The fusiform shape of the tumor cells is more pronounced in the recurrent growth.



WILLIAM O. JOHNSON

Microscopic Description.—Sections from different areas show large ovoid cells with abundant cytoplasm lying in a rather scanty stroma. Several areas of necrosis and hæmorrhage are present. The tumor cells have deep-staining, oval nuclei and show an occasional mitotic figure. The cytoplasm of these oval cells are multinucleated. Note.—The histological picture is similar to the other specimen. Gross and Microscopic Diagnosis.—Fibrosarcoma.

Patient made a satisfactory recovery, returning home at the end of one week in good, general condition; subjective symptoms relieved, small amount of serous drainage from wound. Voice improved, able to eat solid food.

were applied over four surface areas, using one millimetre lead, one millimetre brass and Zo, filter eighteen millimetres from the skin.

After this treatment he apparently progressed well until about one month after the last treatment, when the growth rapidly reappeared. He died December 5, 1928, from possible general metastasis to lungs. Necropsy not obtained.

Case II.—Seen through the courtesy of Dr. John R. Wathen and Dr. D. Y. Keith, of Louisville, Ky.

Sept. 19, 1928, 1500 milligrams of radium

Woman, forty-three years of age. Since the age of sixteen, this woman had had an enlargement in the right side of her neck, which was not treated and which had caused no subjective symptoms until August 2, 1928, when associated with a slight cold she noticed that the goitre began to increase in size. In four to five days she had another attack of tenderness in the right side of her neck with more rapid growth of goitre. With tightness of neck, a hacking, spasmodic, unproductive cough, rapidly growing worse, developed. The tumor was excised October 6, 1928, by Dr. J. R. Wathen (Figs. 6 and 7).

Sections from specimen removed at first operation show a replacement of the thyroid gland by the tumor growth which is made up

of elongated cells typical of fibrosarcoma. The epithelial lining cells of the thyroid acini are the cuboidal type. There is no infolding of the acinar walls. Some of the acini contain colloid. No blood vessel invasion is demonstrable.

Convalescence from this operation was uneventful, neck healed readily, no complications. Two weeks after operation she noticed a feeling of pressure on the right side of her neck which was associated with rapid recurrence of growth, and with this excruciating right-sided occipital headaches, loss of weight (fifteen pounds), progressive weakness, variable appetite, aggravating non-productive cough, shortness of breath on exertion, sleep disturbed by pain in neck and back of head.

Four doses of deep X-ray therapy were administered three weeks after operation. These made her quite sick. The condition rapidly progressed and was so painful that the subjective symptoms could not be relieved by sedatives.

To the right of the mid-line there had developed a fungating type of growth which caused considerable enlargement of the right side of the neck. This growth is quite tender, irregular and nodular, with two or three large lymphatic glands, size of marbles, to the right side. Considerable tenderness in post-occipital region. The heart and lungs were clear to percussion and auscultation. X-rays negative. Blood pressure 140/90.



Fig. 6.—Original specimen. Note adenoma in upper portion of specimen.

FIBROSARCOMA OF THE THYROID

November 23, 1928, palliative excision of recurrent growth of the right side of the neck, under novocain block, and nitrous oxide analgesia, with implantation of nine radium seeds three microns each and one hundred and fifty milligrams radium into wound.

Specimen consisted of a mass of tissue measuring ninety millimetres in diameter, with

a somewhat smooth, nodular surface on one side and a shaggy, ragged surface on the other. Cut surface shows different appearances throughout the tumor mass. Some areas are pale gray and homogeneous. Others are pale yellowish and striated in appearance with small, dark red, hæmorrhagic areas scattered throughout. A strip of skin measuring ninety by ten millimetres with attached, underlying tumor tissue similar to above. (Fig. 8.)

Microscopic Description.—Sections from different areas show a rather cellular tumor growth made up of elongated cells which have rather abundant, clear cytoplasm and oval, deep-staining nucleus. Stroma is scanty, consisting of a delicate reticulum. Blood vessels are fairly numerous. Large areas of necrosis are found. Focal areas of hæmorrhage are scattered throughout. An occasional mitotic figure is found.

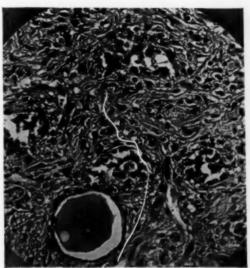


FIG. 7.—Photomicrograph of original specimen, showing replacement of thyroid. No proliferation of lining cells of acini. Magnified x 130,

(Fig. 9.) Gross and Microscopic Diagnosis.—Fibrosarcoma. The woman made a good operative recovery, and returned home Nov. 29, 1928, the wound draining a small amount of serum; voice good. Two weeks later examination revealed a small recurrent growth

Fig. 8.—Recurrent growth. Specimen to left removed from behind hours. Eighteen millimetres and lateral to carotid artery.

at upper and outer edge of sterno-cleidomastoid muscle. Three platinum covered radium seeds were installed under local anæsthesia into this growth.

January 3, 1929, the wound is granulating slowly, there has been a decrease in the size of the recurrent growth in the upper angle of the neck. The patient is weaker and has some pain in the back of the neck when up; when in bed she is comfortable. One hundred milligrams of radium applied over each of three areas for eight hours. Eighteen millimetres distance, one millimetre brass

and one millimetre lead filter. From the response this patient has made it is evident that the result will be similar to the first case, but since the operation, the patient has been free from pain, rests well, her appetite is good and she has a more optimistic view of life, all of which more than compensate for the procedures taken.

WILLIAM O. JOHNSON

Resumé.—These two cases are examples of adenomata of the thyroid, pre-existing for over sixteen years, which, in later life, become malignant. The solution of this problem would have been so simple had the adenoma been removed in the early thirties, which we now know is advisable with

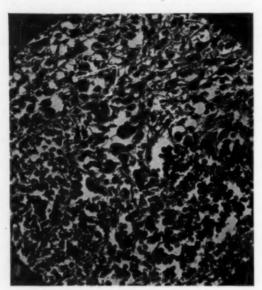


Fig. 9.—Photomicrograph showing large ovoid cells with scanty stroma, multinucleated cells are present. Magnified x 180.

all such adenomas of the thyroid. The two cases present three conditions which, I think, are of sufficient importance to warrant their inclusion among the sarcomas, namely, the rapid recurrence of the growth in two weeks after the primary removal; the apparent failure of the tumor to respond to deep X-ray therapy. with only a fair response to radium therapy; and the tendency of these tumors to remain partially encapsulated. The histological picture and the rapid fatal termination of these cases, together with the aforementioned conditions, lead us to classify them as sarcoma of the thyroid. This diagnosis has been con-

curred with by five professors of pathology. The type of gross specimen, together with microscopic findings, leads us to the conclusion that they are fibrosarcoma.

These cases are presented, not only because of the apparent rarity of this condition, but in the hope that interest might be aroused to remove these adenoma as a preventive measure and avoid such disastrous developments.

BIBLIOGRAPHY

¹ Ewing, J.: Neoplastic Diseases, p. 1027. W. B. Saunders Co., 1922.

² Ewald, O.: Ueber maligne Hundeslrumen. Nebst Bemerkungon über die Sclaretoriche Latigkeit der Schildruse. Ltschr. f. Krebsforsch.

⁸ Crotti, A.: Thyroid and Thymus. Lea and Febiger, 1918.

Graham, A.: Malignant Tumors of Thyroid. Annals of Surgery, vol. lxxxii, p. 30, July, 1925.

⁵ Alibert: (Quoted by Bürcher) Klin. Vertrage, No. 222, 1881.

6 Kaufman: Deutschr Leitsch. f. Chirug., 1879.

Müller and Speece: Malignant Disease of the Thyroid Gland. U. of Pa. Med. Bull., vol. xix, p. 74, 1906.

8 Ehrhardt: Beit. z. Klin. Chir., vol. xxxv, p. 343, 1902.

9 Bauman, H. A. H.: Minnesota Medicine, vol iii, p. 105, 1920.

10 Wilson, L. B.: Malignant Tumors of the Thyroid. Annals of Surgery, vol 1xxiv.

¹¹ Eberts and Fitzgerald: Malignant Disease of the Thyroid Gland. Annals of Surgery, vol. lxxxvi, p. 515, July, December, 1927.

12 De Quervain, F.: Goitre. John Bale and Sons and Danilsson, London, 1924.

HOMO-TRANSPLANTATION OF THYROID TISSUE IN CASES OF COMPLETE THYROIDECTOMY FOR CANCER

By S. O. Portugalov, M.D. of Rostov-on-Don, Russia

FROM THE BORGORAS SURGICAL CLINIC OF THE NORTH CAUCASUS UNIVERSITY, U. S. S. R.

The question of maintaining the function of an organ after radical operations upon it, is a problem of modern surgery. This question was the topic of Rehn's report at the Fiftieth Jubilee Congress of German surgeons.

Lahey, of Boston, has shown how frequently parathyroid bodies are removed even during a subtotal thyroidectomy. He has demonstrated parathyroid bodies entirely surrounded by thyroid tissue in the upper pole of the removed glands. Such a position of parathyroid tissue makes possible its occasional removal during partial thyroidectomy, in which cases the later development of various degrees of tetany occurs. In such cases, Lahey has proposed immediate transplantation of these parathyroids into the belly of the sternomastoid muscle.

Professor Borgoras once attempted to replant the leg in a case of excision of the knee by preserving the vessel-nerve fasciculus. Other operations might unite a necessary radicalism to a simultaneous conservation of the function of an organ. In certain conditions, however, the only way to save a life is to remove an organ entirely. Cancer of the thyroid gland is in this class.

After extirpation of the thyroid, however, there is usually developed a not less serious disease—post-operative myxœdema. In order to replace the lost function of the thyroid, Kocher proposed transplantation of goitre tissue from a case of Graves's disease or the hypertrophic tissue around a nodular goitre. The success following this procedure has given a solid basis to the full removal, in cases of malignancy, of the thyroid gland. Such transplantation of gland tissue is to be preferred to thyroid feeding treatment, a method which is not always sufficient and which condemns a patient the whole of prolonged life to a remedy against which there are cases of permanent idiosyncrasy or gastric intolerance.

The statistical tables of the large clinics of both Europe and the United States show that malignant disease of the thyroid gland is not very rare. On the average, every twenty-sixth operation on the thyroid gland involves a malignant tumor. As to predisposing factors of malignant disease of the thyroid gland, all authorities agree that the presence of a benign goitre often clinically precedes a cancer. A preëxisting benign goitre is pointed out in from 80 to 100 per cent. of thyroid gland cancer cases (Pemberton,² Aschoff, Balfour, Grover-Lloyd, Slesinger, etc.). Thus the adenoma must be looked on, to a certain extent, as a precursor of malignancy.

We have succeeded, after microscopical examination of a specimen removed at operation, in getting histological confirmation of the above-mentioned clinical observation, that the malignant neoplasm may originate in a preëxisting goitre.

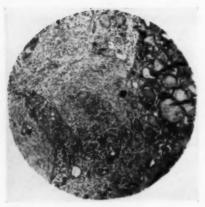


Fig. 1.—Low power view of peripheral part of removed tumor specimen showing a typical struma colloides microfolliculosis.

The microscopical investigation of the removed tumor showed a different picture in the parts situated at the periphery and those more deeply placed. From the periphery to the centre is to be seen at first a typical picture of microfollicular colloid struma. (Fig. 1.) Among the isles of follicles and single follicles both narrow and broad streaks of fibrous, with here and there hyaline, connective tissue are seen. All the follicles are filled with colloid and are everywhere surrounded by a single layer of cubical, somewhat flattened, epithelial cells. A little deeper, a papilliferous structure of tissue is already to be seen. (Fig. 2.) The base of the papillæ is formed by porous and fibrous connective tissue in which vessels of capillary type have been established. These papillæ themselves are covered by a single

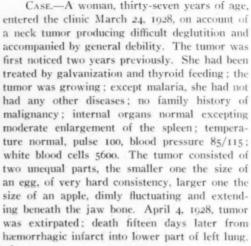




FIG. 2.—Photomicrograph of the centre part of the same specimen as in Fig. 1, Papillary cyst.



Fig. 3.—Photomicrograph of a more deeply situated part of the same specimen on Figs. 1 and 2. Papilliferous cystocarcinoma.

row of slightly flattened cylindrical epithelium with basal disposed nuclei. Sometimes the epithelial cells are placed here in many rows immediately after this (Fig. 3, left side). The papillæ disappear gradually and epithelial cells form here continuous acini-shaped heaps. The acini are covered by several layers of cells and have small cavities. In such places a polymorphism of epithelium is already clearly notable. Finally (Fig. 3, right side), we meet a powerful growth of hyaline connective tissue immediately adjacent to the just-mentioned area, which tissue is penetrated by malignant cells much changed in their shape, irregularly spread and characterized by the multiple strata and other evidences of abnormal growth tendency. All these conditions now declare a malignant neoplasm and warrant a diagnosis of cystocarcinoma papilliferum.

HOMO-TRANSPLANTATION OF THYROID TISSUE

Thus in the study of the histological picture of this removed tumor we have found, from its periphery to its centre, three alternating pathological processes: a benign goitre, a papillary cyst and a malignant epithelial tumor. Such a successive change of pathologic processes in the same specimen warrants this as a histologic argument in addition to the clinical observation that cancer has been preceded by a benign goitre. In my opinion, a real danger attends the retention of an adenoma without early operation.

A total extirpation of the affected thyroid gland inevitably causes more or less severe symptoms of hypothyroidism. In such cases of hypothyroidism in our clinic, thyroid homo-transplantation has been used to compensate for the lost function of the thyroid, using for the transplant, usually, goitre pieces from a case of Graves's disease or from the hypertrophied thyroid tissue around a nodular goitre. In the transplantation, not only are pieces of the gland put into the receiver's body, but also an anastomosis is made of one of the thyroid arteries of the transplant to the patient's inferior epigastric artery or common carotid artery. The veins of the transplant are previously ligated in order to form a more abundant filling with blood of the transplanted piece. The circulation of the blood through the divided and anastomosed vessel is, at first, feeble and therefore it is necessary to hinder the efflux of blood by ligating the veins of the transplanted gland. There is no danger of a hæmatoma formation because a moderate amount of blood flowing at first through an anastomosed vessel can be absorbed by the neighboring tissue.

As to the later fate of such a transplant, various authors have been of varying opinions, although there have been many evident clinical facts of success. German authorities, especially Lexer and his school, are of the opinion that the homo-transplantation of endocrine glands is not successful and that this treatment is merely palliative. They affirm that the homo-transplant disappears sooner or later in the receiver's body. Others (Albert Kocher, Voronov, Retterer, Mauclair) assert that the homo-transplanted tissue is active at least for several years. The opinion of both sides is corroborated by many clinical observations and experimental observations, but of course only those cases in which the subsequent condition of the homo-transplant has been verified by autopsy or by exploratory incision during life, a long time after operation, are of value. Such an examination of patients after several years of successful function of the homo-transplantation of thyroid tissue is known in literature at least in two cases. Von Eiselsberg communicates a case in which total thyroidectomy was done by Billroth upon a girl of seventeen years, followed by typical signs of tetany. Twenty-five years later, the patient came to the Eiselsberg clinic where her tetany was treated by transplanting a piece of thyroid gland from a goitre patient into the space between the peritoneum and the fascia. This woman died from mental disease several years after the transplantation. A post-mortem examination showed that the transplantation had left no marks at the place of its transplantation, while an hypertrophic goitre the size of a hen's egg was found in the lower portion of the liver. In the second case (Stieda) death occurred from tuberculosis in three and one-quarter years after transplantation when all symptoms of myxœdema had disappeared without leaving any traces. At the necropsy no marks of the transplanted thyroid tissue were found, but the receiver's own gland was observed to be small and atrophic.

In addition to these valuable observations, we can produce a similar case.

A woman, fifty-six years of age, was admitted to the Borgoras Surgical Clinic Janu-



Fig. 4.-Before operation.

uary 27, 1928, eight months after an operation of total thyroidectomy for cancer by Doctor Gutnikov. During this time, the patient had developed characteristic symptoms of severe myxœdema. The first signs of hypothyroidism had appeared six weeks after a total thyroidectomy. The patient was then treated by thyroid feeding, but even small doses of thyroid preparations caused her grave attacks of cardiac palpitation, collapse included, also stomach trouble. This was a phenomenon of a permanent idiosyncrasy to different products of thyroid gland tissue. On her admission, the important findings were dryness of skin and hair, constipation, ædema of face and tongue. and also intense somnolence (Fig. 4); pulse 60; temperature subnormal, kidney secretion defective. Eight weeks after admission a homo-trans-

plantation was done by Professor Borgoras. The transplant was taken from a compatible blood patient whose goitre had to be removed. The transplantation was accompanied by an anastomosis of the superior thyroid artery of the transplant to the patient's inferior

epigastric artery. A fortnight after the operation, all her symptoms of myxædema had disappeared. She was discharged in perfect health without any symptoms. Fig. 5 shows her on discharge from the hospital. After she had been quite well for six months, a metastasis of cancer of the liver was suspected and a course of Röntgen treatments was applied. Within a few weeks all her symptoms of myxœdema came back. She returned to the clinic where, seven months after the first transplantation, a second one was done. This operation was done at the site of the original one in order to examine the condition of the thyroid tissue transplanted seven months previously. Macroscopically, there could be detected no marks of the thyroid isograft. Several bits of surrounding tissue were removed for micro-



Fig. 5 .- After operation.

scopical examination which investigation made by Doctor Zazybin did not reveal any traces of transplanted thyroid gland, but showed only scar, muscular tissue and fat.

REFERENCES

- ¹ Kocher, Albert: The Treatment of Hypothyroidism by Thyroid Transplantation. Brit. Med. Journ., p. 3274, 1923.
- ² Pemberton, John deJ.: Malignant Disease of the Thyroid Gland. Annals of Surgery, vol. lxxxvii, p. 369, 1928.

PRIMARY HYPERNEPHROMA OF THE LIVER

(GRAWITZ TUMOR)

By Thomas L. Ramsey, M.D.

OF TOLEDO, OHIO

FROM THE DEPARTMENT OF PATHOLOGY OF ST. VINCENT'S HOSPITAL

HYPERNEPHROMA is essentially a tumor derived from cells embryologically from the same origin as the cells of the adrenal cortex.

Adrenal rests have been demonstrated in numerous tissues which have their origin close to the developmental areas of the adrenal glands. As growth takes place these cells are carried with the developing organ or tissues to

locations sometimes quite distant from their site of origin.

Broman 1 has tabulated the areas where adrenal cell nests have been found as follows: Male: Rete testis and epididymis; paradidymis; spermatic cord. Female: Ovary; tubes. Both Sexes: Retroperitoneal tissue beneath the kidney poles; along the spermatic and ovarian veins; iliopsoas muscle at the pelvic



Fig. 1.—Photograph of the bisected gross specimen showing the variegated structure of the tumor.

brim; at the iliosacral synchondrosis; in the kidney capsule or substance; on neighboring vessel walls; in the solar and sympathetic plexus; between the transverse colon and the spleen; beneath the capsule of the right lobe of the liver; in the pancreas.

Quite a voluminous literature on this subject has appeared since Grawitz expressed his belief in the origin of these tumors from misplaced adrenal cells, and although this origin seems most definite there are some writers who are inclined to different views and who advance other theories; some claiming that these tumors develop from such tissues as the endothelium of lymphatics or blood vessels, while others think that the growth is an adenoma or, if malignant, a carcinoma. Other writers have found characteristics in their cases which led them to classify these growths as sarcomata or angiosarcoma.

Bothe,² in an excellent article upon the subject of hypernephromata, reviews the literature and gives the opinion of many writers on this subject. He tabulates the following theories as to their genesis:

(1) That they originate from adrenal cell rests; (2) that they are alveolar sarcomata having nothing to do with cell rests; (3) that they are endotheliomata which take their origin from the endothelial lining of the perivascular lymph spaces; (4) that they are adenomata if benign, carcinomata if malignant; (5) that they develop from the endothelial cells lining the blood-vascular spaces; (6) that they are derived from the epithelial lining

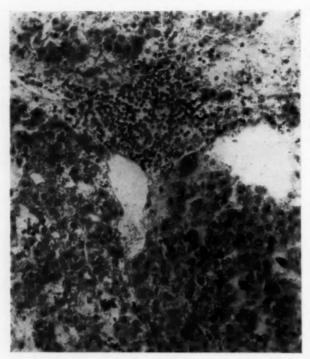


Fig. 2.—Areas showing pseudo-fascicular arrangement of the cells; two blood spaces and an accumulation of lymphocytes in the fibrous stroma. Magnification 125 diameters.

of the uriniferous tubules; (7) that they originate from islands of embryonic nephrogenic tissue.

Bothe also reviews the modern conception of the embryological development of the adrenal glands and kidneys and adds some original observations of the physical relationship existing between these anlagal cells. He concludes that the embryological inclusion of suprarenal cells within the metanephric anlagan is not improbable and that the tissues other than the metanephros are susceptible to such inclusion, especially those which are developed from the mesonephros, mesonephric

duct and genital ridge. In general, he states that from embryological, chemical and pathological observations hypernephromata are quite in accord with the views originally presented by Grawitz.

Primary hypernephromata reported as occurring in organs other than the adrenals or kidneys may be tabulated as follows:

- 1. In the broad ligament, 3: Weiss, Peck, Glynn.
- 2. In the ovary, 4: Gibben, Peham, Scudder, Glynn.
- 3. In the uterus, 1: Eastman.
- 4. In the pelvis, 1: Chiari.
- 5. In retroperitoneal tissue, 1: Glynn.
- 6. In the pancreas, 1: Glynn.
- 7. In the spermatic cord, 2: Chevassi, DeBarnardi.
- 8. Falciform ligament, 1: Starr.
- 9. In the liver, 4: Adami and McCrae, Rollston, Schmorl, Vecchi and Noves.
- 10. In the tongue, 1: Coenus.
- 11. In the ciliary body, 1: Schlipp.

PRIMARY HYPERNEPHROMA OF THE LIVER

The development of the adrenal anlagan in close embryological relationship with those of the kidneys, ovaries, testicles and epididymis, the uterus and the liver with their contiguous structures and vessels, readily-explains the frequent finding of adrenal cell rests in these tissues; and if Cohnheim's hypothesis is at all to be considered it is not difficult to understand the development of tumors, both benign and malignant, from such inclusions. The

character of the growth is determined by the stage of development of the anlagal cells at the time they become separated from the main cell mass, and also by the tissues in which they become included.

Case reports of primary growths of this nature in other than embryologically contiguous developing structures are more difficult to explain, but rather than assume that these are metastatic growths and that the original tumor not found, it is just as possible to believe that such embryological formations are possible and are not necessarily cells separated

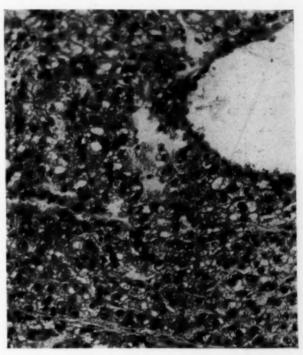


Fig. 3.—Compact area with no definite cellular arrangement. The blood space appears to be lined by the neoplastic cells. Magnification 125 diameters.

from the developing adrenal organ. According to Bothe's views cases of primary hypernephroma of the liver can thus be easily explained as this organ is often the site of adrenal cell inclusions.

Many observers have reported finding these rests in this organ. Schmorl ³ found them in four out of 510 autopsies. Beer ⁴ reported six positive findings in 150 livers examined. Five were in or just beneath the capsule, one was in the liver parenchyma close to the cortex. In all, the inclusions were in the right lobe. Bothe ² mentions four such primary growths in his table. Abell ⁵ in reviewing the literature on this subject collected ten cases reported as primary hypernephroma of the liver. Seven of these were in the right lobe, one in the left lobe (Pepere), which Ewing ⁶ believes was an hepatic adenoma, and two were in the folds of the falciform ligament. Abell also adds a case report of a similar tumor, observed by him, occurring in a young female child, thirteen months of age. The growth was encapsulated and was attached along the right anterior border of the liver. The

THOMAS L. RAMSEY

kidneys, spleen and other abdominal organs were normal. The adrenals showed no pathology.

REPORT OF AN ADDITIONAL CASE

The patient was an adult male, fifty-seven years of age. The onset began about one year previous to his admission to the hospital, with vomiting immediately after partaking of any heavy meal. There was no nausea or pain, no blood in the regurgitated

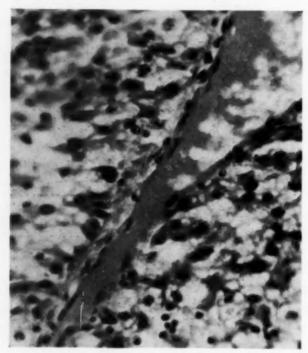


FIG. 4.—Area showing blood sinus lined with flattened endothelium. The tumor cells can be seen invading the fibrous tissue of the wall. Magnification 200 diameters.

material, nor was there any blood in the stool. The patient had never been jaundiced. During the last year he had lost thirty-three pounds in weight.

This patient had had the usual childhood diseases, but previous to the onset of this last illness he had always been fairly well. He had sustained an injury in 1892 at which time he had a fracture of the skull and of the bones of both lower extremities. There was no history of malignancy in his family.

Physical Examination.—
The patient was an elderly white male of about fifty-seven years. The teeth and gums were in poor condition.
The neck and throat showed no apparent pathology. The chest was symmetrical, the lungs were normal, the heart was not enlarged and there were no murmurs. The abdo-

men presented a large, firm mass in the upper right quadrant extending into the lower quadrant. The mass was movable, but was apparently attached to the liver and located just beneath the anterior abdominal wall. The extremities were normal. Neurological findings were normal.

Hospital History.—On the day following his admission to the hospital the abdomen was opened. A tumor was found arising from the under surface of the right lobe of the liver. The growth seemed well encapsulated. No other abnormalities or growths were found in the abdomen and no other nodules were found in the liver. The growth was removed and the liver repaired. No great amount of bleeding attended the operation and after packing around the liver border with iodoform gauze and rubber tissue the wound was closed in layers in the usual manner, leaving in the gauze and rubber drain. The patient was given 2000 cubic centimetres of saline solution later, followed by glucose and soda bicarbonate solution. The pulse rose steadily from 100 at 11 A.M., immediately following the operation, to 126 at 3 P.M., became weak and irregular and over 150 by 5 P.M. The patient died the same day at 8:40 P.M. There was no elevation of the temperature and death was most probably due to hæmorrhage from the liver. No autopsy was permitted.

Pathological Report.—The growth was ovoid in shape, measuring about twenty-two

PRIMARY HYPERNEPHROMA OF THE LIVER

centimetres in length by about fifteen centimetres in diameter, the lower surface was very ragged in appearance where fragments of liver tissue were adherent to a fairly definite connective-tissue capsule. The external surface was inclosed in a thickened fibrous wall which was continuous with the capsule of the liver. The growth was of a yellowish-brown color, and upon bisecting the tumor the capsule was readily visible as described above. The cut surface (Fig. 1) presented a variegated appearance as to color and consistency, areas of reddish-brown to black and others yellow to orange and

red. Some parts were firm, others soft and spongy. The growth presented a honeycombed appearance with small cystic spaces filled with blood. Several sections were taken for microscopic examination.

Microscopic Findings .-The various areas presented rather a variety of findings. The sections (Figs. 2, 3, 4 and 5) varied from dense, compact cell masses, where the cells were well stained and having the appearance of mature adrenal cortical cells arranged in irregular fascicular manner with only a slight degree of lipoidosis and with clear staining nuclei, to areas of less compact structure with large, pale, swollen cells filled with lipoid granules and having rather pale nuclei. In these softer areas considerable destruction of the structure caused the sections to have rather an

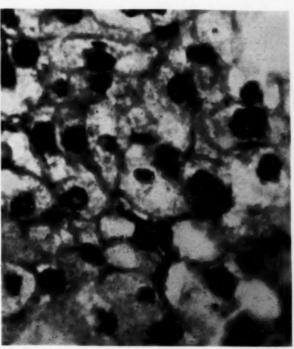


Fig. 5.—Showing the intercellular fibrillar connective tissue network, the faintly granular protoplasm and the large hyperchromatic nuclei. Magnification 500 diameters.

amorphous appearance showing only invading wandering cells, red cell collections and blood spaces.

The cystic areas were filled with blood or blood clot in various stages of organization. Areas of productive inflammation and fibrosis gave the growth a scar-like contracted appearance here and there throughout the tumor mass. Fine filamentous fibrous tissue strands formed a supporting framework showing many blood vessels, and extended into the capsule which was well formed and fibrous in appearance.

The greater part of the cellular structure showed variation from mature cell elements to cells of embryonic type, many showing multiple nuclei and others irregular mitosis.

The picture presented corresponds in its entirety to that of malignant hypernephroma elsewhere. No liver substance or biliary ducts were seen in any portion of the growth.

Comment.—Tumors having the characteristic appearance of hypernephromata occurring as primary growths in various parts of the body most assuredly support the conclusion that these tumors develop from embryological inclusion of suprarenal cells within these various organs at the time of their close proximity to the developing suprarenal organ. Most of these growths, as does the one herewith reported, present in some areas the typical appear-

THOMAS L. RAMSEY

ance of early developing adrenal cells. Considerable variation in cell structure takes place as the tumor develops and even progresses into malignancy. All of these growths may be considered malignant from a standpoint of the production of metastases in other locations; however, the term malignant hypernephroma is used only to include that group which shows malignant characteristics in the cells comprising the growth.

SUMMARY

A case of malignant primary hypernephroma of the liver is reported, having developed in a man fifty-seven years of age. The growth was in the right lobe well encapsulated and removed by surgery.

Microphotographs of different areas of the tumor are presented, showing variations in the cellular structure.

A brief review of the literature is given and comment is made upon the place of this tumor in pathology.

REFERENCES

¹ Broman, I.: Quoted from McFarland. Surg. Path., p. 103, 1924.

² Bothe, A. E.: Annals of Surgery, vol. lxxxiv, No. 1, p. 57, 1926.

³ Schmorl: Ziegler Beitr. Path. Anat., vol. ix, p. 524, 1891.

Beer, E.: Ztschr. f. Heilk., Wien. u. Leipz., vol. xxv, p. 381, 1904.

⁶ Abell, I.: Annals of Surgery, vol. 1xxxvii, No. 6, p. 829, 1928.

⁶ Ewing, J.: Neoplastic Diseases, p. 762, 1922.

THE SPREAD OF BACTERIA FROM THE GALL-BLADDER TO THE LIVER*

By WALTON MARTIN, M.D.

OF NEW YORK, N. Y.

In view of the interest taken in the relation of hepatitis to cholecystitis during the last ten years, I take this occasion to call attention to reports of bacterial examinations made from small pieces of the liver excised at operations in which the gall-bladder was removed for cholecystitis and cholelithiasis. The patients, twenty-seven in number, had well-established lesions. No instances of lipoid (strawberry) gall-bladder or instances in which there were very slight inflammatory changes in the wall of the gall-bladder, without stones, were included. The cases chosen belonged in a group in which the disease was confined to the gall-bladder. That is to say, no cases were included in which there was evidence of obstruction or infection of the common duct. In six of the patients there was a history of transitory jaundice in the past, but in no instance before operation had a diagnosis been suggested of commonduct stone or a stone found in the common duct at operation. The common duct was soft and not thickened when inspected.

I have attempted to study a group in which the gall-bladder lesion was well established and to determine how often we could find bacteria in the adjacent liver tissue when examined within a few days of an acute attack.

A small, wedge-shaped piece was taken from the liver margin within five centimetres of the gall-bladder bed. The dimensions of the piece were about $1 \times 1\frac{1}{2} \times \frac{3}{4}$ centimetre. The piece of liver was dropped immediately into a sterilized test-tube in which was a second, small test-tube half filled with sterilized water. The tube was taken immediately to the bacteriological laboratory, Doctor Famulener, the director of the laboratory, or his assistant, Miss G. P. Pierson, carried out the bacteriological studies.

It seemed to me that liver tissue undergoing changes set up by autolytic enzymes might serve as a satisfactory culture medium, well adapted for organisms lodged there; that the technic was simple and would avoid contamination. The inner tube containing water was placed there to prevent the drying of the small section. At first, sealed, moistened tubes were used. The method with an inner tube, devised by Doctor Famulener, proved more satisfactory. For comparison a second fragment was taken, or a portion of the first fragment, and dropped at the same time into a tube containing Rosenow's medium. After twenty-four hours' incubation smears were made and cultures taken, aërobic and anaërobic, upon blood agar and Huntoon's medium

^{*} Read at the joint meeting of the New York Surgical Society and the Philadelphia Academy of Surgery, February 13, 1929.

WALTON MARTIN

and dextrin broth. These examinations were repeated at the end of fortyeight and seventy-two hours and, in several instances, after five days.

The gall-bladder wall was sent to the laboratory for histological examination. The mass of liver tissue we felt justified in removing was too small to furnish material both for bacteriological and histological study, but we assumed that many of the sections of the liver would have shown the changes, classed under the heading hepatitis, which have so frequently been found in the neighborhood of an inflamed gall-bladder.

The details of these examinations will be given at the end of the paper. I purpose here to call attention to the number of negative findings, to discuss the different ways that microörganisms may reach the liver and the types of microörganisms when the findings were positive.

It is interesting, in studying the zone of inflammation about any focus of infection, to consider how much the area examined represents the defense reaction, walling in the infecting microörganisms, and how much it represents evidence of irritation from bacteria spreading out into the tissue of the zone under consideration, usually in the direction of the lymph flow. For example, it is well known that streptococci are found in the lymphatics in advance of the red area in erysipelas, whereas it is also well known that the concentration of microörganisms in the walls of an abscess decreases gradually until at the margin there may be a cellular exudate and œdema with no microörganisms.

In 77 per cent, it was not possible to cultivate bacteria from the liver tissue. Such findings might be expected from the reports of the results of bacterial examinations of the bile in the gall-bladder, the gall-bladder wall and the bile of the common duct. These examinations have been made from time to time by different observers in different countries and with different technic after cholecystectomy for cholecystitis and cholelithiasis. In general, one may say that, except for the reports of A. L. Wilkie 1 on the findings in the lymph gland near the cystic duct, to which I will refer later, the number of negative findings has been a conspicuous feature. Judd 2 writes: "We have made, on a number of occasions, bacterial examinations of the bile and the gallbladder wall, the bile has only been positive in 7 per cent, and in none of the groups examined was the gall-bladder wall positive in as many as 50 per cent." In Wilkie's 1 series of fifty examinations the bile was positive in 12 per cent, and the submucosa showed cocci in twenty-one out of fifty. Wagner,3 in 465 cases in which the bile from the common duct and the gall-bladder was examined, reported 55 per cent. negative. The cases reported were all of advanced disease and in forty-nine it was considered necessary to drain the hepatic duct.

These negative findings may be interpreted as evidence that bacteria have a tendency to die out, not only in the bile but also in the gall-bladder wall. The violent disturbance shown clinically by a pronounced attack of pain and accompanying symptoms, and shown histologically by a pronounced exudation into the tissue, may represent the reaction of the body and its tissues in destroying the bacteria, few in number and of no considerable virulence, and

in overcoming mechanical obstruction. Even in empyema of the gall-bladder, Wagner ³ found the purulent contents sterile in thirteen out of fifty cases and sterile in twenty-four out of twenty-nine instances of hydrops.

In six instances in our series, bacteria were found in the fragment of liver tissue examined. (Table A, Cases I, II, VI, XIII, XVI, XX.) In three out of the six, the bacteria were few in number and were difficult or impossible to grow, as if of low vitality or dead; in two Gram-positive micrococci, probably enterococci, were obtained from smears of the autolyzed liver, but they could not be obtained on culture; in a third a few Gram-negative bacilli, probably bacillus coli communis, were obtained in direct smear of the fortyeight hours' autolyzed liver tissue, it was impossible to recover them for growth and identification on any of the media tried, aërobically or anaërobically. There was no growth on Rosenow's medium from a portion of the same fragment. In one of the six, the organism belonged in a group of which the pathogenic significance is uncertain; a Gram-positive diphtheroid organism was identified on the fifth day in the autolyzing liver tissue, which could be recovered by cultures on the usual media. Of the remaining two, in one no organisms were found in specimens of the autolyzing liver tissue but a fragment dropped at the same time into Rosenow's medium showed staphylococci. In the other, a Gram-negative bacillus of the colon group was identified.

In reviewing these findings it is well to bear in mind that bacteria found in the liver in the zone adjoining the gall-bladder, or inflammation of the liver tissue in this zone (hepatitis), by no means justify the conclusion that the bacteria have passed from the gall-bladder or that the cellular reaction has spread from an inflamed gall-bladder.

In the ordinary domestic animals bacteria are found in the organs in a very large number of instances. Ford,4 using the cat, the dog, the guinea pig and the rabbit, found bacteria in the liver in at least 70 per cent. Each species and each animal showed its peculiar bacteriology. The microörganisms were slow to grow. He writes that: "Either the bacteria are present in small numbers in the organs at the moment of death, and only develop gradually after the organs are excised, or the normal bactericidal or inhibitory substances of the organs, originally powerful enough to prevent the growth of the bacteria, are gradually decomposed after the connections between the organs and the animal body are broken, thus permitting a slow development on the part of the microörganisms." Desoubry and Porcher,5 by numerous experiments, established the fact that during digestion bacteria of all kinds may pass through the normal mucous membrane of the intestine and may be found during several hours in the chyle and blood. It is probable that these bacteria are arrested and destroyed in the liver. Last year, Berg and Jobling 6 reported in the Proceedings of Experimental Biology and Medicine the presence of living anaërobic bacteria in the liver of the dog.

It is probable that in man bacteria reach the liver in the same way from time to time and are arrested and destroyed there, and that at times this

4

destruction is accompanied by signs of reaction which we call hepatitis. The presence of bacteria in the liver or the hepatitis coincident with cholecystitis does not, by any manner of means, imply a sequence in the happenings. Moreover, not only are microörganisms arrested in the liver, but certain of them pass out with the bile. For example, the presence of streptococcci was detected by Mathes and Schultz ⁷ in a dog with a biliary fistula, fifteen minutes after intravenous injection. I know of no studies of bacteria in the lymph flowing from the liver after massive intravenous inoculation.

A curious condition has been noticed by Counseller and McIndoe,8 in studying corrosion specimens of bile ducts, both intrahepatic and extrahepatic. They studied the normal liver and livers in which there were various grades of cholecystitis and cholelithiasis. I wish to call attention to their findings in eight instances in which clinical investigation had not shown any evidence of previous biliary disease, and in which the presence of stones in the gall-bladder and their absence in the common duct were revealed only at autopsy. In seven, evident dilatation of the ducts had taken place, mild in character but present throughout the whole system. In the study of ten normal livers the diameter of the common duct was found to be about five millimetres, and that of the right hepatic duct to vary from 1.6 to 3.4 millimetres. In the six cases of cholelithiasis the common duct varied from 6.5 to 11.5 millimetres, and the right hepatic duct from three to eight millimetres. Possibly even slight loss of resilience in the gall-bladder wall caused a certain amount of back pressure in the biliary ducts. The amount of dilatation of the ducts seemed to run parallel and in direct proportion to the amount of the pathological change in the gall-bladder wall. In the one instance in which no change was found in the duct system, although there were three small stones in the gall-bladder, the wall itself was apparently in good condition. Such transitory back pressure, enough to cause dilatation of the ducts, might carry bacteria that were passing out with the bile back into the small ducts and prolong the contact of microörganisms, liver cells and stasis bile. But that such prolonged contact can be of serious moment seems unlikely, since even more pronounced dilatation of the duct system has been shown to follow the removal of the gall-bladder. Paradoxically, it has even been suggested that slight degrees of hepatitis are improved by cholecystectomy.

If there is no damage to the endothelial lining of the common duct by a foreign body, as in obstruction from outside the duct, it has long been recognized that the dilatation of the gall-bladder and ducts is unaccompanied by signs of infection. Under these conditions the bacteria, if they chance to be present, seem not to be virulent enough to gain foothold.

The following observation on obstruction due to a neoplasm seems to me pertinent. The patient had had painless jaundice for several weeks; the bile index was 133. Due to slight fluctuations in the jaundice, it was decided to operate to confirm or refute the diagnosis of carcinoma. The usual picture of obstruction due to neoplasm was found at operation: a thin-walled, distended gall-bladder, an enlarged, thin-walled common duct, an enlarged, dark

LIVER INFECTION BY GALL-BLADDER BACTERIA

liver and a mass in the head of the pancreas. Cultures were made from a specimen of bile removed by puncture. The bile was cloudy, slightly thick, light apple-green in color. The cultures were made on Rosenow's medium and blood agar slant. After forty-eight hours' incubation on both media, smears showed small colon-like Gram-negative bacilli which took an uneven stain. The microörganisms could not be recovered by growth on any of the media tried. They evidently had poor vitality and were dying out in the bile. Microörganism were present but they had no invasive capacity. (Table B.)

In contrast to this I report the following observation: A negro woman, very ill with chills and intermittent temperature and jaundiced, was operated on, the gall-bladder excised, and a few stones removed from the common duct. Cultures made from a fragment of the liver showed numerous Gram-positive, oval diplococci and Gram-negative coccoid to bacillary forms. (Table C.)

If the same type of microörganisms is found in the bile, the gall-bladder wall and the adjoining liver tissue, it seems fair to assume that the bacteria may have passed from the gall-bladder wall to the liver tissue. In two of the instances in which the liver tissue was positive for bacteria, these conditions were fulfilled; that is, the contents of the gall-bladder or the gall-bladder wall showed the same type of microörganisms and, in one instance, the same combination of types.

In the six instances with positive findings, staphylococcus was found once, bacillus coli communis twice, enterococcus twice and a diphtheroid organism once. The enterococci occurred as short-chained diploid Gram-positive cocci. These findings are in accord with those reported in the past in the gall-bladder wall and in the bile, except that we have not chanced, in this small series, on the typhus bacillus and we have recorded enterococci instead of streptococci.

In a series of fifty recently reported by Wilkie ¹ the coli communis was found three times in the gall-bladder wall and the streptococcus was reported in the submucosa of the gall-bladder wall twenty-one times. He reports in forty-three out of fifty, that is, in 86 per cent. pure cultures of streptococci in the cystic gland,

The lymph drainage of the gall-bladder is probably largely downward, toward the glands at the hilus, not inward, toward the liver. The course of the lymphatics of the liver and gall-bladder is still imperfectly understood. The diagrams and studies of Sudler ⁹ are largely concerned with the lymphatics of the gall-bladder wall, not of the liver. The diagrams of the vessels carrying the lymph in most of the textbooks are based on the studies of specimens made many years ago by Sappey, by the injection of mercury. Recently, a Japanese observer, Y. Semba, ¹⁰ using Gerota's stain, has followed the course of the lymph flow. His illustrations are much the same as those in Sappey. His description is brief and is devoted largely to the course of the lymph from the liver to the thoratic duct. In Sappey's pictures, in Sudler's and in Semba's, the illustrations show the lymph vessels passing over the abdominal or peritoneal surface of the gall-bladder to the ganglia near the cystic duct. The minute lymph vessels passing from the adjoining surface of

the liver become larger vessels as they pass over the gall-bladder wall, as if they received tributaries. If the opposite, or hepatic, side of the gall-bladder has a similar arrangement of lymphatics, then the main lymph flow from the gall-bladder is downward, toward the cystic gland, not backward, into the liver. This is in accord with Wilkie's finding.

The streptococci reported by Wilkie as present in the cystic gland are described as diploid forms in short chains. They were not bile resistant and fermented mannite.

The finding of enterococci in our series is of interest. Doctor Famulener has, for a number of years, given especial attention to this strain of cocci found in the intestinal flora. In three of the instances reported, as the micrococci could not be cultivated, their identification is uncertain, though morphologically they suggested to him enterococci.

Kurt Meyer,¹¹ Director of the Bacteriological Division in the Virchow Hospital of Berlin, who has also given particular attention to this strain, in a recent article makes the following statement: "The streptococci said to be found in the gall-bladder wall are probably enterococci." In association with Löwenberg he has experimented with rabbits, by injecting intravenously hemolytic streptococcus, streptococcus viridans and enterococcus. The animals were killed in four to twenty-eight days. The gall-bladder was found sterile after the injection of viridans and hemolytic streptococci, whereas, after the enterococcus injections, the microörganisms were regularly found in the gall-bladder. The work of Meyer and his conclusions are reviewed and brought forward in the monograph recently published on the "Normal Intestinal Bacteria and Their Significance for the Organisms" by Nissle,¹² in Wassermann's *Handbook of Microörganisms* (1928).

I wish to call attention: I. To the large number of negative findings in the bile, the gall-bladder and the adjacent liver tissue, even in well-marked cholecystitis with cholelithiasis.

- 2. To the finding of bacteria in the liver tissue which stain imperfectly and cannot be recultivated.
- 3. To the prevalence of types in the liver and gall-bladder that grow normally in the intestinal tract.
- 4. To the fact that the anatomical evidence suggests that the lymph flow from the gall-bladder wall is downward toward the glands at the hilus, not backward toward the liver.
- To the suggestion that hepatitis present with cholecystitis may be a coincident, not a consequent, condition.

It is interesting to consider these statements in relation to common clinical experience. It is very unusual to have a fatal spreading peritonitis following operations of the gall-bladder and common duct, although these operations are frequently accompanied by gross contamination of the peritoneum with bile and gall-bladder contents, especially in opening and draining the common duct. Between attacks patients are frequently fresh colored, well nourished and vigorous, without clinical signs of infection, although when finally

LIVER INFECTION BY GALL-BLADDER BACTERIA

operated on the lesion of the gall-bladder gives every evidence of long standing.

Even in instances where the history dates back for years, after the gallbladder is removed the patients return to good health. They do not show clinical evidence of hepatitis or cirrhosis.

When an obstructing stone is removed from the common duct and normal biliary drainage again established, even when the patients have been deeply jaundiced and have had chills and fever and evidence of severe infection, if they survive the operation the results are astonishingly good. I have had an opportunity to see a few of these patients years after this operation (ten and fifteen years). They have not developed liver cirrhosis or persistent liver infection.

Clinical evidence seems to suggest a low-grade infection with a tendency for the infecting organisms to die out when conditions favorable to the body cells are created.

All these facts suggest that in gall-bladder disease, other factors than infection must be considered. Alterations in metabolism leading to movable concretions and intermittent obstruction are factors in determining the remitting infection.

Experiments show that repeated intravenous injections of millions of streptococci in rabbits produce cholecystitis and cholelithiasis. Such massive contamination does not reproduce etiological conditions seen in the cholelithiasis and cholecystitis in man.

BACTERIOLOGICAL EXAMINATIONS

By L. FAMULENER AND G. P. PIERSON IN THE BACTERIOLOGICAL LABORATORY OF ST. LUKE'S HOSPITAL

Table A.—Microscopic examination of gall-bladder wall and bacteriological examination of liver tissue in twenty-seven cases of cholecystectomy for cholecystitis and cholelithiasis.

CASE I.—C. S., fifty-three years of age. Gall-bladder. *Gross.*—Wall 1.5 centimetres thick, surface covered with adhesions. Many stones found. *Microscopic.*—Sections showed chronic inflammation, papillary hyperplasia; muscular walls invaded with lymphocytes.

Bacteriological Examination.—Fragment of Liver.—Rather large cocci, probably enterococci. Cultures on blood agar slant, Huntoon's and broth showed no growth.

Case II.—E. W., sixty-three years of age. Gall-bladder. *Microscopic.*—Slight but definitely acute inflammation; mucosa was infiltrated with polymorphonuclear leucocytes. There was cedema in muscle layer with infiltration with round cells.

Bacteriological Examination.—Fragment of Liver.—Gram-positive, small, slightly elongated diplococci, probably enterococci. No growth on culture.

CASE III.—I. McD., twenty-six years of age. Gall-bladder. *Gross.*—Wall thick, mucosa thin and eroded. It contained many stones. *Microscopic.*—Section showed chronic productive inflammation and an acute hæmorrhagic inflammation of inner coats, muscles infiltrated and contained a considerable number of polymorphonuclear leucocytes.

Bacteriological Examination.-Fragment of Liver.-Negative.

CASE IV.—M. S., fifty-seven years of age. Gall-bladder. *Gross.*—Wall thick, many stones. *Microscopic.*—Sections showed chronic productive inflammation with thickening and distortion of wall, many glands buried beneath muscle, making cysts. Round-celled infiltration in all coats.

Bacteriological Examination.-Fragment of Liver.-Negative.

CASE V.—B. C., thirty-four years of age. Gall-bladder. *Gross.*—Surface smooth and glistening, mucosa flat and granular, wall thickened and œdematous; small stone present. *Microscopic.*—Sections showed considerable digestion of mucosa, degenerative changes in the muscle and very slight evidence of chronic infection. Few buried glands in the muscle suggesting an old process, now quiescent. Practically no infiltration.

Bacteriological Examination.-Fragment of Liver.-Negative.

Case VI.—M. L., thirty-eight years of age. Gall-bladder. *Gross.*—Peritoneal surface was wrinkled and gray, mucosa finely granular, wall thickened. *Microscopic.*—Sections showed very slight degree of chronic inflammation in the mucosa and muscle and slight infiltration of subserous fat and fibrous tissue. Very little productive lesion in any of these coats. Mucosa fairly well preserved. The lymphoid infiltration was practically the only lesion.

Bacteriological Examination.—Fragment of Liver.—On the fifth day Gram-positive, short, thick, bacillary form developed in the autolyzing liver. Reculture growth on blood agar slant, and Huntoon's medium very thin and translucent, probably a diphtheroid type.

CASE VII.—T. L., thirty-eight years of age. Gall-bladder. *Gross.*—Wall thickened. There were many stones. *Microscopic.*—Sections showed slight alterations, some ædema and round-celled infiltration of all the coats. There were a few buried glands in the muscle, probably also an inflammatory process.

Bacteriological Examination.-Fragment of Liver.-Negative.

CASE VIII.—C. S., fifty-eight years of age. Gall-bladder. *Gross.*—Surface was diffusely granular and punctately injected; wall thick, gray, ædematous; mucosa thin, granular and had a hæmorrhagic, fibrinous exudate adherent to it. A few stones were enmeshed in this. *Microscopic.*—Sections showed thickening due to productive inflammation involving all coats. The process was subacute in the mucosa where desquamation and ulceration were evident, the ulceration extending through the muscle in places.

Bacteriological Examination.—Fragment of Liver.—Negative.

CASE IX.—J. McA., thirty-five years of age. Gall-bladder. *Gross.*—Serosa was injected and hæmorrhagic and coated with delicate adhesions; wall thickened, mucosa eroded and ulcerated. There were a few stones. *Microscopic.*—Sections showed a marked chronic inflammatory process with an extensive productive lesion which had resulted in deposition of much new tissue outside the muscle coat. Muscle was degenerated, mucosa thickened and ædematous. Subserous coat was hyaline, few round cells infiltrated it.

Bacteriological Examination.—Fragment of Liver.—Negative.

Case X.—D. F., twenty-four years of age. Gall-bladder. *Gross.*—Serosa thick, wall thickened and mucosa thick and velvety. There were many stones. *Microscopic.*—Sections showed inflammation affecting all the coats, each being involved in a mass of productive inflammation. The tissue was infiltrated with lymphocytes and was myxomatous throughout. The epithelium was well preserved; mucosa thickened.

Bacteriological Examination.-Fragment of Liver.-Negative.

CASE XI.—L. K., fifty-five years of age. Gall-bladder. Gross.—Eight small faceted stones had ulcerated through the wall and protruded from the surface, covered by a thin layer of serosa. Wall was thin, mucosa atrophic. There were many stones. The mucosa had completely regenerated and was smooth beneath the stones which had ulcerated through. Microscopic.—Sections showed a productive lesion of the mucosa and all the coats were undergoing secondary atrophy. There was a round-cell infiltration of the remaining glands, a few of which were dilated and others atrophic. The muscle showed fewer changes but there was an old productive inflammation outside of it.

Bacteriological Examination.—Fragment of Liver.—Negative.

CASE XII.—E. H., sixty-three years of age. Gall-bladder. *Gross.*—Serosa was roughened by old adhesions. Wall was ædematous and thick, mucosa thin and eroded. *Microscopic.*—Sections showed a thinning and desquamation of the epithelium. The underlying muscle was diffusely infiltrated with round cells and a few polymorphonuclear leuco-

LIVER INFECTION BY GALL-BLADDER BACTERIA

cytes. The muscle coats were separated by dense hyaline connective tissue. The surrounding connective tissue was ædematous and showed numerous small groups of round cells. Stones were present.

Bacteriological Examination.-Fragment of Liver.-Negative.

CASE XIII.—E. F., twenty-five years of age. Gall-bladder. *Gross.*—Gall-bladder was ten centimetres long, serosa smooth, wall two centimetres thick. There were many stones. *Microscopic.*—Sections showed diffuse chronic inflammation with a slight productive lesion and many degenerative changes in the newly-formed tissue, which penetrated all the coats to a slight extent. Lymphocytes in all the coats, muscle thinned, mucosa dilated.

Bacteriological Examination.—Fragment of Liver.—Autolyzing liver negative; liver in Rosenow's medium showed staphylococcus.

CASE XIV.—M. B., thirty-one years of age. Gall-bladder. *Gross.*—Wall was thick and rough, mucosa ulcerated. *Microscopic.*—Sections showed destruction of nearly all the normal structures and infiltration of remaining epithelium and muscle. There was an ulcer on the surface, the base being formed by granulation tissue which was infiltrated with polymorphonuclear cells, and there were many giant cells and large masses of bile pigment deeply buried in the tissue. There were many stones.

Bacteriological Examination.—Fragment of Liver.—Mass for autolysis showed no growth after ten days' incubation.

Case XV.—M. S., fifty-three years of age. Gall-bladder. *Gross.*—Wall was thin; small cystic area 1.5 centimetres in length in wall. Stones present. *Microscopic.*—Sections showed thickening of mucosa in the diverticulum with some papillary outgrowths but very little exudative inflammation. Sections of the adjacent wall showed chronic inflammatory changes with some productive inflammation and atrophy of portions of the mucosa and cystic dilated glands. There was considerable fibrous and lymphocytic infiltration throughout.

Bacteriological Examination.—Fragment of Liver—Negative after six days incubation.

CASE XVI.—A. W., sixty-three years of age. Gall-bladder. Gross.—Omentum wrapped about region of gall-bladder. Much fresh exudate present in the region. Gall-bladder was nine centimetres long; serosa hæmorrhagic, muscosa the same, with ulcerations; wall thick and ædematous. There were many black faceted stones. Microscopic.—Sections showed a marked productive inflammation and thickening of entire wall, due chiefly to cellular fibrous tissue containing endothelial cells, deposited outside the muscle layer. Hæmorrhage, ædema and round-cell infiltration were present.

Bacteriological Examination.—Fragment of Liver.—Gram-negative bacillus identified as bacillus coli communis.

CASE XVII.—M. P., twenty-six years of age. Gall-bladder. *Gross.*—Gall-bladder was eight centimetres long; cystic duct slightly dilated and completely filled with small faceted stones. *Microscopic.*—Sections showed the wall thinned and atrophied; a very slight round-cell infiltration was present. There had been a little thickening outside the muscle.

Bacteriological Examination .- Fragment of Liver .- Negative.

CASE XVIII.—E. K., thirty-two years of age. Gall-bladder. *Gross.*—Fifty stones were present. Serosa and mucosa were normal. *Microscopic.*—Sections of wall showed comparatively slight changes. There was some desquamation of the epithelium. Very few infiltrating cells could be found and no active inflammatory process could be made out.

Bacteriological Examination.-Fragment of Liver.-Negative.

CASE XIX.—J. W., forty-seven years of age. Gall-bladder. *Gross.*—Gall-bladder was eight centimetres long. Serosa smooth and opaque; wall thick and œdematous; mucosa velvety. *Microscopic.*—Sections showed very poorly preserved tissue with a slight amount of chronic inflammation in the muscle and subserous tissue.

Bacteriological Examination.-Fragment of Liver.-Negative.

CASE XX.—L. S., thirty-seven years of age. Gall-bladder. *Gross.*—Serosa smooth and white; wall 0.2 centimetres thick; twenty-five stones present. *Microscopic.*—Sections showed a chronic inflammation of moderate degree with slight thickening, hyperplasia of the mucosa and a slight productive lesion in it.

Bacteriological Examination.—Fragment of Liver.—Very few Gram-negative bacilli on smear after forty-eight hours; unable to recover for growth and identification.

CASE XXI.—C. W., twenty years of age. Gall-bladder. Gross.—Gall-bladder seven centimetres long; serosa ædematous and slightly hæmorrhagic; wall thickened by ædema and yellowish exudate. Mucosa was thin, hæmorrhagic and partially ulcerated and showed small amount of fibrin. Cystic duct was dilated and contained a faceted stone. Five other stones were found. Microscopic.—Sections showed considerable thickening due to a productive lesion which had involved all the coats. The mucosa was hæmorrhagic; stroma infiltrated with fresh blood. The muscle wall and other coats contained a large number of round-cells and a few polymorphonuclear cells, but the largest amount of thickening was due to the deposited new tissue outside the capsule.

Bacteriological Examination.—Fragment of Liver.—Negative.

CASE XXII.—M. S., fifty-one years of age. Gall-bladder. *Gross.*—Surface was smooth and pale; wall slightly thickened; mucosa thin. There were many stones. *Microscopic.*—Sections showed very slight inflammatory changes with slight thickening due to productive inflammation outside the muscle and to a slight infiltration with lymphocytes throughout. The muscle was degenerated and atrophic; epithelium desquamated.

Bacteriological Examination.-Fragment of Liver.-Negative.

CASE XXIII.—C. P., thirty-four years of age. Gall-bladder. *Gross.*—Gall-bladder was adherent to the duodenum and omentum. Serosa was thick and opaque; wall one centimetre thick. Mucosa was hæmorrhagic; several stones were present. *Microscopic.*—Sections showed thickening in some areas and thinning in others. Muscle was hypertrophied, cedematous and hyaline and infiltrated with polymorphonuclear cells.

Bacteriological Examination.-Fragment of Liver.-Negative.

CASE XXIV.—L. F., thirty-eight years of age. Gall-bladder. Gross.—Serosa was smooth, wall slightly thickened. Mucosa was dull. About thirty stones were present. Microscopic.—Sections of the wall showed it thin and atrophic and there was very slight chronic inflammation in all the coats with a little productive tendency and slight round-cell infiltration throughout.

Bacteriological Examination.—Fragment of Liver.—Negative.

CASE XXV.—J. W., thirty-six years of age. Gall-bladder. *Gross.*—Wall was 1.2 centimetres thick and the duct equally so. Serosa was granular and hæmorrhagic; wall firm and yellowish. Mucosa was hæmorrhagic and largely eroded; calculi present. *Microscopic.*—Sections showed an acute process superimposed upon a chronic one, with ulcerations in the mucosa and suppurating areas underlying them. The muscle was perforated and there were extensive hæmorrhages with polymorphonuclear infiltration and an early productive lesion. Thickening due chiefly to new tissue outside the muscle.

Bacteriological Examination.-Fragment of Liver.-Negative.

CASE XXVI.—T. L., forty-four years of age. Gall-bladder. *Gross.*—Gall-bladder was distended, serosa dull, peritoneum thickened and œdematous. There was a large stone in the ampulla. Mucosa was diffusely hæmorrhagic and showed areas of yellowish fibrinous exudate. *Microscopic.*—Sections showed a well-marked degree of thickening due to a subacute inflammatory process which involved the entire wall. Most of the epithelium was eroded and hæmorrhagic; fibrin and granulation tissue replaced it. Muscle was also necrosed and infiltrated with eosinophiles, polymorphonuclear leucocytes and lymphocytes. Outside the muscle there was also a thick cellular layer of new tissue.

Bacteriological Examination.-Fragment of Liver.-Negative.

CASE XXVII.-L. DeF., twenty years of age. Gall-bladder. Not examined.

Bacteriological Examination.-Fragment of Liver.--Negative.

LIVER INFECTION BY GALL-BLADDER BACTERIA

Table B.—Bacteriological examination of bile in patient with carcinoma of the head of the pancreas.

CASE.—A. T., sixty-seven years of age. Bacteriological Examination.—Bile.—Cultured on Rosenow's medium and blood agar slant, after forty-eight hours' incubation, showed small colon-like Gram-negative bacilli which took an uneven stain; could not be recovered for growth.

Table C.—Section of liver from patient with cholecystitis and cholelithiasis and stones in the common duct.

CASE.—F. P., thirty-eight years of age. Gall-bladder. *Gross.*—Wall was thick, mucosa eroded; there were many stones. *Microscopic.*—Section showed marked degree of inflammation with exudation in all coats.

Bacteriological Examination.—Fragment of Liver.—Section of liver undergoing autolysis showed numerous Gram-positive diplococci and Gram-negative bacillary forms. These were identified as bacillus coli communis (3 culture test) and enterococcus, but the enterococcus was of lower thermostability than usual (killed by heating at 58°-59° C. for thirty minutes).

BIBLIOGRAPHY

- Wilkie, A. L.: Bacteriology of Cholecystitis. Experimental Study. Brit. Jour. of Surg., vol. xv, p. 450, 1928.
- ² Judd, E. Starr: Cholecystitis. Coll. Papers of the Mayo Clinic, vol. xix, p. 324, 1927. ³ Wagner, A.: Beiträge zur Bakteriologie der Gallenwege, Mitteilungen aus den Grenz-
- gebieten der Medizin und Chirurgie, vol. xxxiv, p. 41, 1922.
- ⁴ Ford, William W.: On the Bacteriology of the Normal Organs. Jour. of Hygiene, vol. i, p. 277, 1901.
- 5 Desoubry et Porcher: De la présence de microbes dans le chyle normal chez le chien. Soc. de Biol., p. 101, 1895.
- Berg and Jobling: Bactericidal Function of the Liver. Proceedings of Exp. Biol. and Medicine, vol. xxiv, p. 433, 1927.
- Mathes and Schultz: Proc. of Soc. of Exp. Biol. and Medicine, vol. xxiii, p. 155, 1925.

 *Course ler and McIndoe: Dilatation of the Bile Ducts (Hydrobenatosis). Surg. Course
- Counse'ler and McIndoe: Dilatation of the Bile Ducts (Hydrohepatosis). Surg., Gynec. and Obstet., vol. xliii, p. 729, 1926.
- Osudler, Mervin T.: The Architecture of the Gall-bladder. Johns Hopkins Hospital Bulletin, vol. xii, p. 126, 1901.
- ¹⁰ Semba, Y.: Anat. untersuchungen über die Lymphgefässe der Leber. Arch. f. Klin. Chir., vol. cxlix, p. 350, 1928.
- ¹¹ Meyer, Kurt. und Löwenberg, Walter: Experimentelle untersuchungen zur enterokokkeninfektion der Gallenblase. Klin. Wochenschrift, vol. v, p. 989, 1926.
- ¹² Nissle: Die normalen Darmbakterien und ihre Bedeutung für den Organismus, Handbuch der Path. Mikroorg, vol. vi, p. 401, 1928.

SURGERY OF THE PANCREAS

AT THE ROOSEVELT HOSPITAL FROM 1918 TO 1928 *

BY ALFRED STILLMAN, 2D, M.D. OF NEW YORK, N. Y.

Though disease of the pancreas, amenable to surgical relief, is rare, it occurs frequently enough for a surgeon to feel the need of keeping posted on the best methods of treatment. To see what could be learned of the pancreas from hospital case histories I have reviewed those records at the Roosevelt Hospital from 1918 to 1928. The study may be of some interest and I hope provoke profitable discussion.

Acute Pancreatitis.—So far as we now know acute pancreatitis, acute hæmorrhagic pancreatitis, acute pancreatic necrosis, suppurative pancreatitis and abscess of the pancreas probably are varying degrees of pathology from the same exciting cause. The symptoms when marked are fairly well appreciated, but the etiology is still under discussion and the last word, we hope, has not yet been said as to treatment.

Of the etiology Professor Von Schmieden and Doctor Sebening, of Frankfurt, from a study of their cases and of the literature and of answers to a questionnaire covering 2137 cases treated, say that the association of cholelithiasis and acute pancreatic necrosis is more than coincidental. From their questionnaire replies, 894, or 69.8 per cent. of the 1278 cases operated upon, had simultaneous gall-stones, and of these 174 were in the common duct and fifty-seven in the papilla. But of their own thirty-eight cases where search for the stone was most thorough thirty-one, or 81 per cent., had cholelithiasis with fifteen in the common duct and seven in the papilla. They believe that stones signify the probability of a flow of bile into the duct of Wirsung either by lodging in the papilla or by a spasm set up blocking it. The stone need not be found at operation as it may have passed into the intestine. But during its passage back flow may have occurred or duodenal contents have gained entrance through the dilated papilla and entered the duct of Wirsung.

Von Schmieden reports the literature as showing that fifty cases of invasion of the duct of Wirsung by ascarides had results similar to those in cases with stone incarcerated in the papilla, and gives the details of a case of his own. Infection through the lymphatics or the blood stream is still given as a cause, though most probably a theoretical one. Eggers could find no evidence of bacteria in the fat necrosis or in the peritoneal exudation of six cases he studied. Operative trauma is listed as another cause. Such operations as partial excision of the pancreas for adherent ulcer or for biopsy, as partial gastrectomy with burial of the duodenal stump in the head of the

^{*} Read before the New York Surgical Society, February 13, 1929.

SURGERY OF THE PANCREAS

pancreas, as splenectomy with ligation of the tail of the pancreas, all have been followed by the disease.

The symptoms in the severe case may be easy of interpretation, but in milder ones very difficult. The disease often starts in like previous attacks of gall-stone colic, the pain suddenly becoming excruciating and constant, little if any relieved by morphine, and causing the patient to toss and turn seeking some position of relief. It radiates as in gall-stone colic, but may be girdle-like. It is most intense to the left of the mid-line if the body and tail of the pancreas alone are involved. Vomiting is severe, frequent and continued. Shock ensues quickly. The fever varies from subnormal to 103°, depending on the intensity of the process.

The physical signs are: upper abdominal distention, but not so marked as that of peritonitis or ileus, tenderness and sometimes the palpation of a mass. Occasional signs are: icterus, cyanosis of face and extremities, glycosuria and fatty stool, though there is generally absence of bowel movements or even flatus. The leucocytes vary from normal to 15,000 or more, with

85 per cent. to 90 per cent. polymorphonuclears.

Of a total of 57,336 admissions during the ten-year period there were nine cases of acute pancreatitis. All were operated upon but one, a married woman of thirty-five years, who three months before had a pleurisy with effusion, nine weeks later a return of pleuritic pains followed by sudden band-like abdominal pain, persistent vomiting, cyanosis, tenderness in the epigastrium and shock. She died within twenty-four hours. Autopsy showed acute hæmorrhagic pancreatitis and tuberculous pleurisy. Two others died after operation, both with pulmonary complications. One of these had a cholecystostomy with removal of stones from the gall-bladder and drainage to the pancreas, but without incision of the overlying peritoneum; the other, the only one with a previous gall-stone history, had a cholecystectomy, incision of the common duct and removal of several stones, but no drainage of the pancreas. Of the recoveries one had incision and drainage of the pancreas, one had drainage only, three had cholecystostomy with extraction of stones and one had no intraperitoneal procedure.

The treatment of acute pancreatitis in the milder degrees may be watchful waiting, but otherwise is operative. The peritoneum over the pancreas should be incised or torn to give escape to the activated pancreatic juice, thus helping to prevent its retroperitoneal spread, then limiting its activity in the peritoneal cavity by drains and tampons. With the associated gall-bladder disease, and even without the discovery of stones, but because of the frequent connection of the two conditions the gall-bladder or common duct should be drained. Cholecystectomy alone would be inadvisable because of increased bile pressure. The more elaborate operations of anastomoses, the gall-bladder or common duct to duodenum or stomach, would be out of order owing to the added time of operation, the poor adhering qualities of the serosal surfaces around the inflamed pancreas and because sutures would be unreliable.

Chronic Pancreatitis.—Sailer, writing in 1910, says of the pathology of chronic pancreatitis that "the ordinary form, as in all other forms of chronic inflammation, consists of degenerative changes in the cells and proliferation of the connective tissue associated with round-cell infiltration." The etiology is the same as for acute pancreatitis and often follows the latter. Certain general infectious diseases cause chronic pancreatitis, such as the type described in the newborn suffering from hereditary syphilis. Of the symptomatology Sailer says it resolves itself practically into:

(a) Some discomfort apparently associated with the stomach: (b) evidence of indigestion; (c) pain of any degree or variety, sometimes in the neighborhood of the umbilicus and sometimes elsewhere in the abdomen. Of the more definite signs occasionally there are: (d) jaundice, (e) a distended gall-bladder, and (f) a more or less evident mass in the region of the umbilicus.

Of these cases there were nine, having, therefore, the same incidence as the acute form. She has symptoms referable to the gall-bladder as pain in the gall-bladder region radiating to the side or back, nausea, vomiting and two of these had jaundice. The operative procedure in two cases was cholecystectomy, in four cases cholecystostomy. The provisional diagnosis had been cholelithiasis in all, though three only had stones and the enlarged hard pancreas was a surprise finding. Of the remaining three, one had upper abdominal pain and a mass which was thought to be pancreas. Exploratory operation confirmed the diagnosis, but nothing further was done. One had a four-year history of indigestion, upper abdominal pains in winter, occurring four hours after meals, relieved sometimes by warm drinks. Jaundice developed and clay-colored stools appeared. Exploration revealed a normal gall-ladder and ducts, induration of the pylorus and an enlarged nodular head of the pancreas. Twenty-seven months later this patient was symptom free and had gained forty pounds. The final case had a three months' history of non-radiating umbilical pain, jaundice, and four to eight putty colored movements a day and a loss of forty pounds in weight. No free hydrochloric acid showed in a test meal. Exploration for obstructive stone showed a thick, grayish gall-bladder which was removed, a chylous liquid in the peritoneal cavity and an enlarged head of the pancreas. About once a month thereafter a paracentesis aspirated quarts of this chylous liquid. He died in six months, possibly of carcinoma of the pancreas.

The treatment of chronic pancreatitis for the most part is a matter of attending to the associated biliary disease. Drainage of the gall-bladder may be followed by remarkably good results. Otherwise the treatment is symptomatic, directed mostly toward combating indigestion.

Cysts of the Pancreas.—A classification of pancreatic cysts by Robson and Moynihan is as follows:

(1) Retention cyst; (2) proliferative cyst: cystic adenoma, cystic epithelioma; (3) hydrated cyst; (4) congenital cystic disease; (5) hæmorrhagic cysts; (6) pseudocysts.

SURGERY OF THE PANCREAS

Primrose says to this must be added dermoid cysts, as a result of a recent communication by Judd in which he describes a cyst, arising in the body and tail of the pancreas, containing hair and one tooth. Pseudocysts are most probably traumatic and develop in the lesser sac, the connection to the pancreas not being very certain.

The etiology is still obscure, but the most common causes are chronic interstitial pancreatitis, biliary disease, and trauma. The cysts occur at any age, about equal in the sexes, though in this series there were five women to one man, and may or may not contain pancreatic ferments. Opie states: "The presence in cystic contents of one or more enzymes resembling those of the pancreas was formerly believed to give proof that a cyst had its origin in the pancreas. Not infrequently one or perhaps all of these enzymes are absent in the contents of a pancreatic cyst, whereas fat-splitting diastatic or proteolytic enzymes are found in fluids not derived from the pancreas." In one of our cases the fluid examined for enzymatic action was positive.

The symptomatology of pancreatic cyst is dependent on the precedent causative disease, such as biliary calculi and pancreatitis, on its size and weight and fixation to neighboring organs, or on sudden increment. Pain across the abdomen, sharp, of short duration, and maybe radiating downward or to the back, is frequent. Loss of weight, indigestion, nausea, vomiting and constipation are more infrequent. The cyst may be firm or fluctuant, fixed or movable, local or extending from diaphragm to pelvis.

Our records show six cases of cysts of the pancreas, all but one in women, the youngest a woman of twenty-nine years. Confirmation of one was by operation elsewhere. In another operated upon for relief of intestinal obstruction due to ventral hernia, who died of meningitis, the cysts, dilatations of the pancreatic ducts, were found at autopsy. The third case undergoing salvarsan treatment developed jaundice and a palpable epigastric tumor. His gall-bladder was removed for stones, and a preliminary walling off by tampons of the cyst of the pancreas was done and the cyst aspirated and drained a week later. He died after nineteen days and autopsy disclosed a stone in the papilla of Vater, necrosis of fat and of the head of the pancreas. The fourth case had lost fifty pounds weight in five months and showed a large epigastric mass extending to the navel, firm and slightly movable. This mass in the head of the pancreas was aspirated, yielding three quarts of green liquid, then opened and the clots removed and the cyst wall sutured to the abdominal wound. Death followed twelve days later with acetone and diacetic acid in the urine. The fifth case was a hæmorrhagic cyst, but its connection with the pancreas was not certain. The clots were turned out and the cavity drained. In the last case after aspiration of the cyst the wall was excised rather easily.

In regard to treatment Primrose reported a case in which he opened the posterior parietal peritoneum and sutured its edges to those of the anterior parietal peritoneum at the site of the incision and then drained the cyst retroperitoneally, so to speak. This method he had not seen described, the usual one being to suture the wall of the cyst to the anterior parietal peritoneum or to the skin. It seems probable that the peritoneum overlying a cyst is often not distinguishable as a separate structure from the cyst wall and is sutured with it to the anterior wound. Whether one totally or partially extirpates these cysts or drains them depends on the character of the cyst. Gobell is quoted as giving a 10.7 per cent. mortality for total extirpation and 55.5 per cent. for partial extirpation. If the cyst is too firmly adherent to adjacent viscera or too broad based and deep in the pancreas it is better to drain. If the posterior peritoneum is free it should be sutured to the anterior incision, or if not the incised edges of the cyst wall should be sutured there.

Pancreatic Calculi.—Though no cases of pancreatic calculi occurred in the ten-year period of this paper the records of two, in 1914 and 1917, are inserted for the sake of completeness.

Seeger in 1925 looked up all the cases of pancreatic calculi in the literature, ninety-nine, of which twenty-two had been operated upon, and added his own operative case. Of these twenty-three operative cases two died, a mortality of 8.5 per cent. Calcium carbonate is an important constituent of pancreatic calculi, but as the normal pancreatic secretion contains none of this substance the formation is attributed to an altered secretion. Ligature of the pancreatic ducts fails to produce them. They are whitish or gray, but at the papilla may obtain a coating of bile.

Sistrunk reported five cases from the Mayo Clinic, included in Seeger's series of twenty-three. He says pancreatic calculi are often multiple and frequently associated with diabetes; that the symptoms are indistinguishable from those of biliary colic; that the surgeons routinely examining the pancreas at operation rarely find them, though they occur once in every 1500 autopsies; that multiple stones may give a sense of crepitation on palpating the pancreas.

Three of Seeger's operative series had passed pancreatic calculi per rectum. One of these was a patient of Doctor Dowd, whom he showed before this Society in March, 1915. Doctor Dowd opened an indurated area in the head of the pancreas and drained out, in a whitish pus, about thirty soft, small stones. The pus later showed a staphylococcus growth.

Of the two cases at the Roosevelt Hospital, the first was a man, of forty-two years, who had been operated upon three years previously for acute pancreatitis. His present admission was for acute intestinal obstruction from which he died without operation. Autopsy showed the obstruction in the duodenum from adhesions of the previous operation and the pancreatic ducts full of stones, completely blocking the outlet to the intestine. The gall-bladder and biliary ducts were normal. The second case a man, of thirty-eight years, had for four months right hypochondriac pain, cramp-like, radiating to the epigastrium, made worse by eating and relieved somewhat by a bowel movement. Jaundice and clay-colored stools had

SURGERY OF THE PANCREAS

been present for two and a half months. The patient had lost thirty-three pounds. The liver was enlarged to the umbilicus and the gall-bladder was palpable. At operation the pancreas was examined through a slit in the gastrocolic omentum and the head found enlarged. It was incised and a stone extruded. The incision was enlarged, deepened and drained. A choledochoduodenostomy was then done. Patient left the hospital on the thirty-eighth post-operative day, but a month later returned and died of diabetes. Autopsy showed multiple calculi in the pancreas surrounded by pus with very little normal pancreatic tissue left.

Seeger says his collected operative series demonstrated that the action of the pancreatic juice on the tissues is not to be considered dangerous. In two cases which died no evidence of fat necrosis was found nor was any other complication present which was due to the fact that pancreatic tissue had been worked on. In no case of removal of stones did a permanent fistula develop.

Carcinoma of the Pancreas.—In this ten-year period there were twentytwo cases of carcinoma of the pancreas, thirteen in females and nine in males, reversing the sex incidence of Herringham (quoted by Speed) of five males to one female, and of Speed of thirty-six males to sixteen females. Of those whose ages were specified all but three (34, 37 and 45) were between fifty and sixty-seven. The duration of illness was a matter of six months or less, and often of only a few weeks. Eleven died in the hospital. The most constant symptoms were: loss of weight, 70 per cent.; pain, 73 per cent.; jaundice, 63 per cent.; and weakness, 61 per cent. Loss of weight is marked, ten to fifty pounds in a couple of months and is usually accompanied by feebleness. Pain in the early part of the disease is occasional and not severe, but increases in frequency and severity until almost constant. It varies from a gnawing or rolling sensation to a cramp-like pain and may radiate across the abdomen or into the back. Jaundice appears late and is steadily progressive. Of other symptoms nine had some degree of indigestion, gas, belching or vomiting; two had constipation, and one diarrhoea. There were two cases of diabetes and two had ascites.

In over a third of the cases an abdominal mass other than an enlarged liver or spleen was palpated. X-ray findings in eight cases were suggestive of tumor of the pancreas and in three of them the diagnosis was unequivocal. Findings considered suggestive are defects of pyloric filling which the röntgenologist recognizes as extragastric, a widened duodenal arch, or stasis in the duodenum.

Revealed at operation or autopsy the tumor was in the head of the pancreas except in two cases, and these were in the body. The growth was often most extensive, including the liver, gall-bladder and ducts, the stomach, duodenum and omentum.

Little can be done for these patients. Nineteen were operated upon: two had cholecystogastrostomy, and one cholecysto-enterostomy which cleared up the jaundice; three had cholecystostomies, and one a gastro-enterostomy

ALFRED STILLMAN, 20

because of obstruction at the pylorus. Cholecysto-enterostomy or cholecystogastrostomy is the procedure of choice when possible since these patients fail rapidly when external drainage of bile is instituted. Speed says: "I have not found in the literature successful complete pancreatectomy in cancer of the pancreas. Some operators have considered that they have performed complete pancreatectomy, but autopsy has disproved their belief. Partial pancreatectomy can be successfully done. We must recall that a large percentage of the patients are deeply jaundiced. Blood coagulation time is greatly increased up to eight or even ten minutes, so that operative procedures are hazardous. The leaking of pancreatic secretion after operation in the abdominal cavity always results in death. Exudate from the injured pancreas which is not the normal secretion prevents the formation of salutary peritoneal adhesions, and catgut stitches are rapidly digested. Pancreatic juice mixed with blood is very toxic and when introduced into the peritoneal cavity will cause death without the aid of infection."

LITERATURE

Speed, Kellogg: Jour. of Med. Sciences, vol. clx, p. 1, July, 1920.

Sailer, Joseph: Jour. of Med. Sciences, vol. cxl, p. 330, September, 1910.

Von Schmieden, Prof.: Surg. Gyn. Obs., vol. xlvi, pp. 735, 751.

Eggers, Carl: Annals of Surgery, vol. lxxx, p. 193. Primrose, A.: Surg. Gyn. Obs., vol. xxxiv, pp. 431-436.

Sistrunk, W. E.: Annals of Surgery, vol. lxxiv, p. 380. Opie, Eugene: Disease of Pancreas, p. 266, 1910.

Seeger, S. J.: Surg. Gyn. Obs., vol. xl, pp. 841-846.

Archibald, E.: J. A. M. A., vol. 1xxi, p. 798.

LEFT VAGUS SECTION AND PARTIAL GASTRECTOMY FOR DUODENAL ULCER WITH HYPERACIDITY

(PRELIMINARY REPORT)

By Eugene Klein, M.D. of New York, N. Y.

PROM THE SURGICAL SERVICE OF DR. A. A. BERG AND FROM THE LABORATORY OF THE MOUNT SINAI HOSPITAL

The theory of partial gastrectomy for gastroduodenal ulcer is based on two principles: (1) The operation removes the ulcer and the region in which ulcers most commonly occur. In gastro-enterostomy, on the other hand, the ulcer is left *in situ* and may or may not heal. (2) Free hydrochloric acid in the gastric contents is usually markedly reduced or eliminated. We believe that gastrojejunal or jejunal ulcers rarely, if ever, form in an anacid medium. Both of these principles have been fully discussed in previous papers.¹

There are four phases of gastric secretion. They are briefly as follows:

- 1. The primary (cephalic, psychic). Gastric secretion follows the sight, smell, taste or chewing of food. The stimulus to secrete is carried to the stomach over the vagus nerves and ceases if these are severed.
- 2. The secondary (gastric). The presence of the products of protein digestion in the stomach produces a secondary stimulus to secretion before the primary phase ends. These protein products do not directly stimulate the acid glands which are situated in the body and fundus. They act upon the antrum or distal third of the stomach in some unknown way and cause the liberation into the blood of substances that stimulate the acid cells.² The operation of partial gastrectomy removes the antrum of the stomach and hence the site of stimulation for the secondary phase.
- 3. The intestinal. This starts about three or four hours after the administration of food.³
- 4. The continuous. In a large number of individuals there is a continuous secretion of acid into the stomach without any apparent stimulus. The amount varies widely in different individuals and also in the same individual from time to time. We do not know the mechanism of this secretion, but it seems possible that it reaches the stomach over the vagi.⁴

In a previous paper the acid ⁵ findings following the operation of partial gastrectomy were discussed. Table I shows the results obtained.

Although there was a marked reduction in the acid, contrary to a widely prevalent belief, the operation did not produce anacidity in the large majority of the duodenal ulcer cases. Following the operation there is usually an immediate reduction of the acid figures. There then follows a further progressive fall in the acidity for a period of six months or longer. After six months 25 per cent. of the patients who had had a partial gastrectomy for duodenal ulcer showed anacidity, and 41 per cent. hypo-acidity. The

5

EUGENE KLEIN

unpleasant fact remained that 17 per cent. of the patients still had hyperacidity. These were cases in which very high acid figures were present before operation. Evidently the removal of the second phase of gastric secretion by partial gastrectomy was not in itself sufficient to bring about a hypo-acidity or anacidity.

TABLE I

Maximum Free Acid After Partial Gastrectomy in Fractional Test Meals

				Number	
A	nacid	o to 20	20 to 50	50 and above	of Cases
Duodenal:					
Before operation		4%	36%	60%	50
Recent	9%	9%	46%	36%	11
Old	5%	41%	17%	17%	12
Gastric:					
Before operation		28%	60%	12%	25
Recent	5%	33%	11%	11%	9
Old100	0%				3
Gastrojejunal:					
Before operation		11%	67%	22%	9
Recent	5%	25%	50%		4
Old 50	0%		50%		2

"Recent" refers to cases examined immediately after operation; "old", to cases examined six months after operation; "before operation" in gastrojejunal group refers to cases examined before partial gastrectomy.

To all those who have studied the problem of gastroduodenal ulcer there has undoubtedly come the realization that the disease varies through all grades of intensity. On the one hand there are those with an exceedingly mild form of ulcer, and on the other hand, those in whom a tendency to recurrence clings so tenaciously that it defies all manner of therapy. On the one extreme are the ulcers found at autopsy that have healed spontaneously with little or no symptoms, and on the other, cases such as those of Haberer 6 or Holst,7 where repeated resections higher and higher on the stomach were necessary to effect cures. This means that the tendency toward healing varies in different individuals. It accounts for the fact that medical care and the less radical procedures are followed by healing in some, and that the more radical operation of partial gastrectomy is necessary in others. We have at present no means of segregating these groups before operation. In order, therefore, to insure the largest number of cures many surgeons perform the operation of partial gastrectomy routinely. We do feel that the tendency to recurrence is most marked when the pre-operative acidity is very high in the Rehfuss test and when the patient is the so-called highly "nervous" type. It was, therefore, with much disappointment that we noticed the persistence of hyperacidity in 17 per cent. of the duodenal ulcer cases six months after partial gastrectomy.

Was there any other measure that could have been instituted to insure anacidity? Partial gastrectomy removed the second phase of acid secretion.

VAGUS SECTION AND GASTRECTOMY FOR DUODENAL ULCER

That left the primary, the intestinal and the continuous phases. Was it possible to eliminate any of these phases? Obviously to influence the intestinal phase would have been very difficult. This narrowed our attention to the primary and the continuous. The primary phase undoubtedly acts over the vagus nerve and it seems likely that the continuous secretion results from the stimuli coming down the same pathway. Section of the vagi therefore would have eliminated the primary and perhaps the continuous secretion. A very large number of observations have shown that experimental section of both vagus trunks at the level of the cardia is not followed by any permanent ill effects.8 It was deemed safer, however, after experimental work to be discussed in a subsequent communication, to section only the left vagus in man. This nerve sends branches to the anterior half of the body and fundus of the stomach and presumably influences the acid cells located in these parts. The operation has now been done eight times by Dr. A. A. Berg. The trunk of the left vagus is sectioned near the cardia. The procedure is not difficult and adds only a few minutes to the gastrectomy. If the lesser curvature is placed on the stretch the nerve can be felt as a taut, inelastic strand. The cases that have been chosen are those in which the Rehfuss test showed a marked hyperacidity before operation and which we had reason to expect, from previous experience, were likely to remain acid after the resection.

TABLE II

Patient	Date of Operation	Pre-operative Acidity	Acidity Three Weeks Post-op.	Last Test Meal
1. L. G.	5/19/28	112-122	16-34	0-40-11/10/28
2. M. B.	6/2/28	106-114	0-14	0-12-10/19/28
3. L. M.	6/6/28	88-110	0-78	0-12-10/29/28
4. A. H.	7/18/28	62-72	0-38	0-16-10/18/28
5. H. K.	8/8/28	140-150	42-54	0-20-10/19/28
6. H. P.	8/29/28	90-102	0-44	0-18-10/19/28
7. S. L.	9/1/28	80-96	24-40	0-18-10/21/28
8. S. B.	9/29/28	74-86	18-34	0-12-11/10/28

The figures represent the highest free and total acidity in the Rehfuss test (three hours) before operation, three weeks after operation, and shortly before completion of this report. The dates in the last column indicate the date on which the last test was done.

All of the patients at present show a gastric anacidity. In every case a Rehfuss test has been carried out for a period of three hours. Table II shows the highest acid figures in the test before operation, three weeks after operation and shortly before completion of this report. The last tests have been done from two to five months after operation, depending upon the time which has elapsed. The phenomenon of the progressive reduction in acidity mentioned above is again noted. But whereas after partial gastrectomy for duodenal ulcer only one quarter of the patients were anacid even after six months, after left vagus section plus partial gastrectomy eight consecutive cases were all anacid after a much shorter interval. Furthermore, these latter cases unlike the former were chosen only from patients with very high pre-operative acidity.

EUGENE KLEIN

At present none of the patients have any gastric symptoms. All are well nourished and have gained weight. The procedure has not been attended by any mortality.

No conclusions can be drawn from so small a group. Should the operation, however, furnish a method to produce an anacidity in duodenal-ulcer patients with marked hyperacidity it may prove of value. We do not believe any recurrence would take place under such conditions. This preliminary report is presented in the hope that others may be willing to use the procedure and report their results.

SUMMARY

Section of the left vagus at the level of the cardia in addition to partial gastrectomy has been performed in eight cases of duodenal ulcer with marked hyperacidity. Whereas after partial gastrectomy alone only one quarter of the patients are anacid, in eight cases where in addition the left vagus was sectioned all are at present anacid.

REFERENCES

- Klein, Eugene: The Fundamental Principles of the Treatment of Gastric and Duodenal Ulcers. Arch. Surg., vol. xiii, p. 730, 1926; Gastric Secretion after Partial Gastrectomy. Jour. A. M. A., vol. lxxxix, p. 1235, 1927.
- ² Sawitsch and Zeljony: Zur Physiologie des Pylorus, Arch. f. d. ges. Physiol. (Pflügers), vol. cl, p. 128, 1913; Lim, R. K. S., Ivy, A. C., and McCarthy, J. E.: Gastric Secretion by Local Mechanical Stimulation. Quart. Jour. Exper. Physiol., vol. xv, p. 12, 1925.
- ³ Ivy, A. C., Lim, R. K. S., and McCarthy, J. E.: The Intestinal Phase of Gastric Secretion. Quart. Jour. Exper. Physiol., vol. xv, p. 55, 1925.
- ⁴ Carlson, A. J.: The Control of Hunger in Health and Disease, Chicago, pp. 234-245, 1916.
- ⁵ Klein, E.: Footnote 1, second reference.
- 6 Haberer, H.: Zur Frage des postoperativen Ulcus pepticum jejuni. Arch. f. klin. Chir., vol. cxl, p. 395, 1926.
- ⁷ Holst, J.: Recurrent Post-operative Jejunal Ulcer after Partial Gastrectomy (with English abstract). Norsk Mag. f. Laegevidensk., vol. lxxxviii, p. 111, 1927.
- * Cannon, W. B.: The Motor Activities of the Stomach and Small Intestine After Splanchnic and Vagus Section. Am. J. Physiol., vol. xvii, p. 429, 1906; Auer, J.: Effect of Severing the Vagi or Splanchnics or Both upon the Gastric Motility in Rabbits. Am. J. Physiol., vol. xxv, p. 334; 1909-1910; Gastric Peristalsis in Rabbits Under Normal and Some Experimental Conditions. Am. J. Physiol., vol. xviii, p. 347, 1907; Borchers: Anteil des Nervus Vagus und der motorischen Innervation des Magens im Hinblick auf die operative Therapie von Magenkrankheiten. Beitr. z. klin. Chir., vol. cxxii, p. 547, 1921; Aldehoff and Von Mering: Ueber den Einfluss des Nerven-systemes auf die Funktion des Magens. Verhandl. d. Cong. f. Inn. Med., vol. xvii, p. 333, 1899; Kirschner and Mangold: Die Motorische Funktion des Sphincter Pylori und des Antrum Pylori beim Hunde nach querer Durchtrennung des Magens. Mitt. a. d. Grenzgeb. d. Med. u. Chir., vol. xxiii, p. 446, 1911; May, Page: The Innervation of the Sphincters and Musculature of the Stomach. J. Physiol., vol. xxxi, p. 260, 1904; Klein, E.: Gastric Motility, I. The Origin and Character of Gastric Peristalsis. Arch. Surg., vol. xii, p. 571, 1926.

FACTORS OF SAFETY IN RESECTION OF THE STOMACH FOR GASTRODUODENAL ULCERS*

By Richard Lewisohn, M.D. of New York, N. Y.

By RESECTION of the stomach we mean the removal of a little more than the distal half of the stomach including the pylorus and part of the duodenum. In small gastric ulcers, in pyloric ulcers and in duodenal ulcers the central line of dissection is carried just proximally to the reëntrant angle. When dealing with gastric or pyloric ulcers, the distal line of dissection divides the lumen just beyond the pylorus. In duodenal ulcers the resection may have to be carried down into the second part of the duodenum. Thus the typical operation for the vast majority of gastroduodenal ulcers removes a little more than one-half of the stomach and should be called partial gastrectomy.

In the very large gastric ulcers and in those cases in which the ulcer is situated near the cardia the upper line of dissection must often be carried to within an inch of the cardia. Thus two-thirds or even four-fifths of the stomach may have to be removed on account of a rare high location of the ulcer. This extensive resection is justly called subtotal gastrectomy.

The term "subtotal gastrectomy" has been abused in recent years. Even pylorectomies and partial antrumectomies have been misnamed subtotal gastrectomies. Thus the erroneous impression has been created that practically the whole stomach is removed in every resection for gastroduodenal ulcer.

Partial gastrectomy is the method of choice in between 80 per cent. and 90 per cent. of gastroduodenal resections. Subtotal gastrectomies are performed in not more than about 10 per cent. of gastric resections.

It must be admitted that partial or subtotal gastrectomy is an operation of considerable magnitude. Even in the hands of a capable surgeon the operative mortality will always be larger, following this type of operation than the immediate mortality following gastro-enterostomy. But resection of the stomach will not be able to compete successfully with gastro-enterostomy nor find universal favor, unless the mortality is kept down at a fairly low level.

I would like to point out quite briefly some of the factors which will insure a greater margin of safety in the procedures of partial and subtotal gastrectomy. While no fixed rules can be laid down and each case must be judged individually, an experience extending over six years has taught me to lay stress on certain factors which are apt to lower the operative mortality.

Can every case of gastric or duodenal ulcer be radically resected? Anybody who has studied the pathology of gastroduodenal ulceration in the postmortem room must agree that in certain cases this cannot be accomplished without a subsequent mortality. This is especially true in deep duodenal

^{*} Read before the Joint Meeting of the New York Surgical Society and the Philadelphia Academy of Surgery, February 13, 1929.

RICHARD LEWISOHN

ulcers in which the common duct as well as the ducts of Wirsung and Santorini are so intimately involved in the ulcerative process as to preclude radical removal of the lesion. I have seen large crater ulcers of the second part of the duodenum, where the posterior wall of the duodenum had been eaten away, so that the common duct and the pancreatic ducts opened into a common cloaca. It is wiser in such a case to acknowledge that the technical difficulties are practically insurmountable, rather than go through the steps of a radical removal, only to have death follow one or two days after the operation. In cases of this type, which, fortunately, are very rare, simple gastro-

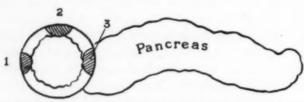


Fig. 1.—Location of duodenal ulcers (diagrammatic). 1.—Anterior wall. 2.—Superior wall. 3.—Posterior wall.

enterostomy or possibly Finsterers "Resection zur Ausschaltung" ought to be performed.

What is true for very deep duodenal ulcers is similarly true for the very rare instances of

gastric ulcers located right at the cardia. These can only be dealt with radically by total gastrectomy. The mortality following total gastrectomy is so very high at present that this operation should be reserved for cases of carcinoma. It is important to emphasize that we have no other surgical means at our disposal to cure these patients. Local excision is impossible and gastroenterostomy is useless. However, I have seen a number of patients with these ulcers who have been quite comfortable for many years; the ulcer disappears and reappears at intervals. The relation of the ulcer to the cardia can be demonstrated by röntgenography.† If cases of this group are encountered on the operating table, it is wiser to desist from a radical removal than to subject the patient to an operative procedure which has at present a prohibitive mortality.

The risks of partial gastrectomy in duodenal ulcer vary considerably according to the location of the ulcer. Ulcers confined to the anterior wall of the duodenum (Fig. 1.) rarely offer any technical difficulties, especially in a movable duodenum. Dissection is somewhat more difficult in ulcers on the superior wall. The ulcers located on the posterior wall—a very frequent seat for duodenal ulceration—require a very careful dissection. Unless the proper line of cleavage is entered in freeing these ulcers the pancreas may be injured and death ensue from a pancreatitis with fat necrosis. In some cases of this type the duodenum is very friable and great care must be exercised to insure an adequate duodenal closure, for duodenal fistulæ still play an important rôle in the complications augmenting mortality.

It has often been stated that ulcers on the anterior wall of the duodenum should be excised, whereas partial gastrectomy should be reserved for the

[†] Lewisohn: Visualization of the Cardia. Annals of Surgery, vol. 1xxxiii, p. 466, 1926.

ulcers on the posterior wall which cannot possibly be removed by local excision. Aside from the fact that local excision fails to safeguard the patient against recurrent ulcers, it would seem advisable to acquire the technic of partial gastrectomy in the easier cases, namely ulcers of the anterior wall.

Experience is one of the foremost factors of safety in any operation. On palpation an ulcer may be located close to the ducts to make resection a safe procedure. Yet careful dissection of adhesions may show that the ulcer is sufficiently distant from the ducts to render resection safe. (Fig. 2.)

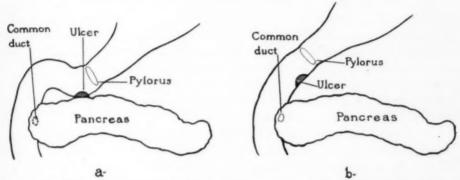


Fig. 2.—Duodenal ulcer in its relation to the pancreas and common duct; a, before; b, after freeing of adhesions (diagrammatic).

The general condition of the patient is of the utmost importance, as in every other major operation. Severe diseases of the heart, lungs or kidneys present greater contraindications against gastric resection than the age of the patient. A sixty-five-year-old patient in fair general condition may be a good operative risk, while a man of fifty with emphysema and chronic myocarditis might be considered unfavorably for this procedure. In avoiding the use of general anæsthesia, especially ether, as much as possible, patients with healed tuberculosis of the lungs—a frequent coincidence in duodenal ulcers—may be subjected to a gastric resection with a sufficient margin of safety.

Cases with marked pyloric obstruction should not be subjected to an immediate operation. Even though the X-ray examination may appear to present a complete obstruction, the fine lumen still allows some fluids to pass through the intestine. A careful pre-operative preparation by repeated lavages (twice daily), subcutaneous saline infusions and additional fluids by the Murphy drip reduces the operative risk considerably. If the occasion demands, glucose is administered intravenously and blood transfusions are given.

I am a strong believer in pre-operative and post-operative blood transfusion of medium amount (300 to 500 cubic centimetres). The general condition of the patient rather than the hæmoglobin estimation should be the guide as to its use. A patient may have a high hæmoglobin and yet require the stimulating effect of a transfusion in order to improve his chances for a smooth post-operative course.

In the same way the actual loss of blood during the operation should not be the only index for post-operative blood transfusion. A patient may be

RICHARD LEWISOHN

severely shocked after an extensive resection and a transfusion given immediately after the operation or on the following day may aid materially in his convalescence.

The proper selection of an anæsthetic is of the greatest importance in gastric operation. General anæsthesia is followed in a large number of cases by post-operative pneumonia which may prove fatal. Splanchnic anæsthesia may cause severe shock. Local anæsthesia, of the abdominal wall, which we used for a number of years, does not effect analgesia during the actual resection.

Spinal anæsthesia, which we adopted about one year ago, seems to be superior to any other form of anæsthesia. We use a French preparation called "Neocaine" which is injected between the eleventh and twelfth dorsal vertebræ. The complete relaxation, the perfect anæsthesia, the reduction in post-operative vomiting, and the very smooth post-operative course in the majority of cases have led us to employ this form of anæsthesia in the vast majority of the cases. Time does not permit a discussion of technical details nor the contraindications to its use.

One defect in the application of spinal anæsthesia in its present form is the fact that the anæsthesia does not last more than about fifty minutes. The Billroth No. 2 resection can rarely be finished in that period. Therefore it is often necessary to supplement spinal anæsthesia with gas and oxygen or even some ether. In our experience spinal anæsthesia does not interfere in any way with the use of a general anæsthetic toward the end of the operation. The use of a general anæsthetic over a short period—usually ten to fifteen minutes—seems to have no deleterious effect upon the patient.

We do not hesitate to use the stomach tube on the day following the operation, whenever the symptoms indicate a large post-operative retention. In post-operative hæmorrhages we wash the stomach out with small quantities of ice-water. It is much safer to evacuate a stomach than have a huge dilatation cause tension on the suture lines. I have never seen any harm done by the early use of the stomach tube.

While the vast majority of the patients have a very smooth convalescence and are less disturbed than many gastro-enterostomized patients, some cases will have a stormy post-operative course during the first few days. This group of cases must get careful individual attention. I see these patients at least three times daily in order to recognize any alarming symptoms at the earliest possible moment. Among the rare complications should be mentioned subphrenic and subhepatic abscesses. It is needless to add that these should be drained as soon as the diagnosis is made.

In conclusion I would like to state that after six years' experience with gastric resection in gastroduodenal ulcers I am more than ever convinced that the end-results of partial or subtotal gastrectomy are far superior to those of simple gastro-enterostomy with or without excision of the ulcer. These operations undoubtedly require careful attention to details before, during and after the operation. However, these efforts are amply compensated by the complete restoration to perfect health of the vast majority of the patients subjected to partial or subtotal gastrectomy.

LATE RESULTS IN PERFORATED GASTRO-DUODENAL ULCERS

By Luis Urrutia, M.D. OF MADRID, SPAIN

WE HAVE operated fifty-two acute perforated gastro-duodenal ulcers in the San Ignacio Private Clinic. Thirty-four of these cases were operated by me personally and the remainder by my associates. There were twelve cases of gastric, thirty-nine of duodenal and one of jejunal ulcer. In seven instances the gastric ulcers were located along the lesser curvature, two in the prepyloric region, one near the cardia, and the remainder at the pylorus.

The perforations were anterior in every case and, excepting one, the ulcers were of chronic type. Three of the patients were women, the remainder men.

In seventeen cases the perforation was sutured with subsequent gastroenterostomy and in thirty-five cases simple closure of the perforation was the only procedure resorted to. In no case was the peritoneal cavity lavaged. Formerly, the abdomen was invariably drained through a suprapubic tube, but at the present time this is resorted to only when the abdominal cavity cannot be satisfactorily emptied by aspiration.

My personal operative mortality was 17.6; (15.7 per cent. for the simple suture and 20 per cent. for suture with gastro-enterostomy). Subtotal gastrectomy, a method which has recently gained in popularity in Germany and Austria, has never been performed by us for acute perforations.

As I have already stated in my paper Sur le traitement opératoire des ulcères gastro-duodenaux perforés read before the "Société des Chirurgiens de Paris," in 1923, I believe that in cases of perforated gastroduodenal ulcers the operation should be the simplest procedure and should be performed as quickly as possible. I am thoroughly convinced that, as in all emergencies the surgeon ought to limit his activities to the actual problem in hand, reserving the radical cure of the ulcer for a later date, should ulcer symptoms persist.

While we consider partial gastrectomy the most suitable procedure for chronic ulcers, having performed it more than 500 times, we do not feel that an operation of such magnitude should be performed for acute perforations. Such a method can be justified only in a very few cases in which closure of the perforation is impossible because of marked induration, but this, indeed, must be rather rare. In our cases such a contingency never occurred.

Deaver states that he performed a gastric resection in a patient who perforated while awaiting operation in the ward, but in this case he was practically dealing with one which might be considered clean. Last year we had occasion to operate a patient with a chronic ulcer (not included in this series) and we found upon opening the abdomen a perforated callus duodenal ulcer. Evidently the rupture took place during the administration of the anæsthetic and a partial gastrectomy was followed by an excellent post-operative

course. However, this case as well as Deaver's, is the exception rather than the rule.

Bruett has tried to establish certain indications for resections and for palliative operations, relying purely upon the bacteriologic findings. During the first six hours after perforation, the peritoneal exudates are regularly sterile or infected with non-virulent streptococci (enterococci, streptococci viridans); after twelve hours the bacillus coli and the hemolytic streptococci predominate. He concludes that although the exudates may be sterile after twelve hours, as sometimes happens, resection should be practiced only in perforations seen during the first six hours, provided the age of the patient is not over forty-five.

When the cases are more advanced, or the person is older than forty-five, the operative mortality of subtotal gastrectomy is very great. Moreover, we agree with Gibson that the suture for perforation within five or six hours should not be productive of a mortality greater than 5 per cent. On the other hand, I believe that partial gastrectomy is the most suitable treatment for sub-acute perforations. Thus, among eighteen cases which I personally operated, gastro-enterostomy was performed in five and partial gastrectomy in thirteen.

Heussner succeeded in 1892 to cure a perforated gastric ulcer by simple suture. The same method was followed in most of the thirty-three cases recorded by Mikulicz in 1897. Patterson, Deaver, Koerte advised gastro-enterostomy at the time of closure of the perforation.

In our first cases we performed gastro-enterostomy in conjunction with suture of a perforated ulcer. However, I feel that gastro-enterostomy does not improve the chances for a subsequent post-operative recovery. In twelve cases in which we were able to secure a follow-up examination, four required a subsequent operation because of a marginal jejunal ulcer and two others presented recurrent symptoms manifested by pain two or three hours after meals, heartburn, vomiting and hæmorrhage.

This means that secondary ulcer was confirmed by operation in more than 33 per cent. in my gastro-enterostomies for acute perforations, and if we base the diagnosis of marginal ulcers on clinical findings the percentage is immediately elevated to 50 per cent.

At a joint meeting of the New York and Philadelphia Surgical Societies in December, 1920, Deaver, who is a strong advocate of immediate gastroenterostomy, reported fifty-five cases treated by suture with simultaneous anastomosis with three deaths, a mortality of 5.5 per cent. He stated that he had not observed a single case of jejunal ulcer in the series. He considered this possibility exceedingly remote, mentioning the case of Petren as the only one in which this complication occurred. The literature, however, contains other cases and while we do not pretend to give an exhaustive list a few names may be mentioned: Haberer, Bruett (2 cases); Delore, Bolton and Trotter, Winkelbauer (3); W. Stanley Wildmann, Speck (2); Kuntz (2); Enderlen (4); Garnett, Wright, Maylard, Baarhelm, Noetzel

(3); Schwarz (3); Girling Ball (3); Pool, Brenner, Spath, Porzelt, Henry, Lewisohn, Horowitz, Fromme (2).

We therefore believe that the danger of secondary ulceration after gastro-enterostomy with suture of the perforation is a real one. Among twelve patients treated by closure with gastro-enterostomy, we have two additional cases suffering from epigastric distress and occasional vomiting.

The results in our operated cases have been satisfactory only in four (33 1/3 per cent.), fair in 33 1/3 per cent., bad in 33 1/3 per cent., although in three of these a cure was affected subsequently by subtotal gastrectomy. It is for these reasons that we have given up gastro-enterostomy as an additional procedure to simple suture of a perforation. We do not perform it unless the suture of the perforation produces an organic obstruction.

At present many surgeons confine themselves exclusively to simple suture. They are not only satisfied with the immediate results but with the remote results. It is well known that some still believe that spontaneous cure of an ulcer follows acute perforation. Meyer has 13 cures in 14 patients, and these are free from troubles; Crisp-English, 11 among 15; Fordyce, 16 among 27; French, 15 among 18; Southam, 28 among 37; Egbert Schwarz, 8 among 10 cases; Fresno and Stincer (Havanna) give the same satisfactory results, the last stating that among 14 cases treated for duodenal ulcer he operated only one, the rest being in perfect condition. Berg confines himself to simple suture in acute perforations and this procedure has given him 70 per cent. of cures. Gibson, in his collection of 123 perforations, states that in 123 operations for perforation there was a mortality of 17.4 per cent.; in 109 cases simple suture was performed; in fourteen cases supplementary gastro-enterostomy was performed or a similar procedure. Follow-up results were obtained in ninety-three cases; twenty-one were re-operated; forty-one were cured, and in thirty-one the results were fair.

Lewisohn stated about one year ago that in thirty-three patients reporting to the return clinic at the Mt. Sinai Hospital for examination, twenty had been perfectly well and free of any gastric symptoms since the suture of the perforation; ten cases had been treated with simple suture of the perforation, and in the other ten cases a gastro-enterostomy had been performed. However, thirteen cases (ten treated by suture and three by suture plus gastro-enterostomy) were not feeling well. Subsequently, four of this last group were re-operated and he therefore concluded that simple suture of the perforation with or without gastro-enterostomy does not cure the patient in 39 per cent. of the cases.

We were able to re-examine twenty-two of our perforated ulcers which had been treated by simple sutures; five required re-operation because of pyloric stenosis, one was suffering from pyloric stenosis before operation, and another patient was subjected to a partial gastrectomy on account of the return of primary gastric symptoms, and a fifth one on account of intestinal obstruction. Unfortunately, the last patient died in our clinic, but the others remained well after the second operation. A sixth patient, sixty-three years of age,

LUIS URRUTIA

operated for an acute perforated ulcer on the lesser curvature, three years later developed an acute pancreatitis which responded well to a second operation. In this celiotomy we did not find any evidence of the ulcer which had been sutured. The patient continued in perfect health after the second operation and was not heard from. Three other patients are suffering from epigastric distress and pains occurring after eating. Finally, there are two more who assure us they are feeling much better than before the perforation took place, but nevertheless from time to time they are obliged to take bicarbonate of soda or some other anacid. Eleven of the patients are perfectly well. Our late results have been satisfactory in fourteen cases, that is 63.6 per cent., and bad in 36.3 per cent. Four of these cases were operated later with good results.

Our results are almost analogous to those observed by Lewisohn. In our series, simple suture proved much better than when combined with gastro-enterostomy. We have had the opportunity to study seven patients who had been operated upon for an acute perforated ulcer treated by simple suture by other surgeons. They consulted me because of recurrent symptoms. Three of these patients were relieved by subsequent medical treatment. Four others were re-operated. A summary of their histories is as follows:

Case I.—L. R., from Santander, thirty-three years old. His gastric complaints date back for eight years. Exploratory laparotomy in Albany, N. Y., in 1918. The suspected ulcer was not found. Three years ago, he had an acute perforation while in Bluefield, W. Va.: suture of perforation. After three months, recurrence of gastric symptoms and tarry stools. Gastric residue: free hydrochloric acid 38, total acidity, 52. X-ray examination showed hyperperistalsis and deformity of the duodenal cap. Re-operation August 8, 1925, cicatrix on anterior wall of the duodenum and ulcer of the posterior wall, adherent to the pancreas. Partial gastrectomy and gastro-jejunostomy (Reichel-Polya). Discharged after two weeks.

Case II.—J. P. S., thirty-six years old, gastric symptoms for five years. Acute perforation with suture two years ago. Recurrence of symptoms since six months. Operation: February 10, 1928, partial gastrectomy and gastro-jejunostomy (Moynihan) for pyloric ulcer. Specimen showed a callus ulcer about two-thirds of an inch in diameter. Excellent post-operative course. Nine months afterward the patient feels perfectly well, having gained six kilos.

Case III.—N. A., thirty-five years old, intermittent gastric symptoms for eight years. June, 1927, first perforation: suture; February 1928, second perforation: suture, Gastric symptoms continued. A few days before he consulted me, he had a large black stool. Test meal: free hydrochloric acid 80, total acidity 102. X-ray examination shows a persistent deformity of the duodenal cap. Operation April 13, 1928, partial gastrectomy with antecolic gastro-jejunostomy (Moynihan.) Specimen showed a callus ulcer of the anterior wall of duodenum and two silk threads of different calibre, corresponding to the two sutures made previously by another surgeon. Discharged cured after two weeks. February, 1929, patient perfectly well.

CASE IV.—P. D. A., fifty-two years old. Gastric symptoms for nine years. Seven years ago acute perforation. Excision of ulcer and suture of the perforation. Relief from symptoms for five years. Chronic perforation with perinephritic abscess, January, 1928. Drainage of abscess. Recurrence of symptoms, accompanied by melaena. I saw the patient on August 20, 1928. He is exceedingly pale (hemoglobin 50) and very feeble. Intensive reactions of blood in stools. August 20, 1928: X-ray examination showed a large niche of irregular contour at the re-entrant angle. Operation, August 25, partial gastrectomy

LATE RESULTS IN PERFORATED GASTRODUODENAL ULCERS

and gastro-jejunostomy (Moynihan). The patient died three days after the operation. Microscopic examination: carcinoma.

Summary.—The clinical material upon which this paper is based may be divided into three groups: (1) fifty-two acute perforations operated on in a private clinic; (2) seven acute perforations operated by other surgeons, four of which I re-operated; and (3) eighteen personal cases of subacute perforations.

Study of these seventy-seven cases leads to the following conclusions:

CONCLUSIONS

(1) In cases of acute duodenal and gastric perforation, a simple suture covers the "vital indication" with the minimum of risk besides effecting an absolute cure of the ulcer in at least 50 per cent. of the cases;

(2) In the other 50 per cent., the ulcers continue in their active stage until a new perforation or malignant degeneration occurs. Therefore, if the symptoms persist the patient should be subjected to a partial gastrectomy, or gastro-enterostomy. The latter procedure is recommended in cases of healed pyloric or duodenal ulcer with stenosis;

(3) Primary gastro-enterostomy with suture of the perforation exposes the patient to the risks of a marginal or jejunal ulcer;

(4) Partial primary gastrectomy is indicated only in cases of sub-acute perforation;

(5) We can hardly agree with those who consider the radical operation the proper method for the cure of jejunal perforations. However, we prefer a simple closure of the perforation and sometimes a subsequent partial or subtotal gastrectomy with jejunal resection. We have employed this method in one case of acute jejunal perforation. The patient is perfectly well ten years after the third operation (subtotal gastrectomy).

BIBLIOGRAPHY

Baarrhjelm in Hartmann: Bulletins et Mémoires de la Société de Chirurgie de Paris, p. 1522, 1913.

Berg in Crohn: Affections of the Stomach. Philadelphia and London, p. 771, 1927. Bolton and Trotter: Clinical Observations on Jejuno-colic Fistula following Gastroenterostomy. Brit. Med. Jour., No. 3, p. 101, June, 1920.

Brenner: Perforated Ulcers of the Duodenum. Annals of Surgery, September, 1927.
Brütt: Beiträge zur Klinik und zur operativen. Behandlung des peptischen Jejunalgeschwürs nach Gastroenterostomie. Bruns' Beiträge zur Klin. Chirurg., vol. cxxvi, 1922.

Bruett: Das perforierte Magen-und Duodenalgeschwir. Ergebn. der. Chirurg., vol. xvi, 1923.

Brütt: Zur Frage der Resektion des perforierten Magen-Duodenalgesch würs. Bruns' Beiträge zur Klin. Chirurg., vol. xxxviii, 1927.

Crisp English in Carson: Modern Operative Surgery, vol. i, p. 557.

Deaver and Pfeiffer: Gastro-enterostomy in Acute Perforated Ulcer of the Stomach and Duodenum. Annals of Surgery, April, 1921.

Delore et Creyssel: Des ulcères récidivants post-opératoires. Journ. de Chirurgie. vol. xxv, p. 385, 1925.

LUIS URRUTIA

Enderlen: Zur Behandlung des durchgebrochenen Magengeschwürs und zur Jejunostomie. Dtsche. Med. Woch. N. I., 1926.

Fromme in Just: Zur Frage des frei in die Bauchhöhle perforierten ulcus pepticum jejuni. Wien. Klin. Woch. 11, April, 1929.

Gibson: Acute Perforations of the Stomach and Duodenum. Journ. Am. Med. Assoc., October 6, 1928.

Girling Ball: Perforated Gastric and Duodenal Ulcers. Saint Bartholomew's Hospital Reports, vol. lix, London, 1926.

Haberer: Zur Frage des Ulcus pepticum jejuni. Arch. f. Klin. Chirurg., p. 119, 1922. Henry: Recurrent Gastric Perforation. Surgery, Gynec. and Obst., June. 1921.

Horowitz: Zur Klinik und Behandlung der perforierten Magen-und Zwölffin gerdarmgeschwüre. Zentralb. f. Chirurg. N. I., 1929.

Just: Loc. cit.

Kuntz: Über das perforierte Magen-Duodenalgeschwür und das perforierte Ulcus pepticum jejuni. Arch. f. Klin. Chirurg. 140, 1926.

Lewisohn: Late Results in Perforated Gastro-Duodenal Ulcers. Annals of Surgery, June, 1928.

Maylard in Hartmann: Bulletins et Mémoires de la Société de Chir. de Paris. 1913, p. 1521.

Nötzel: Zentralb. f. Chirurg. 1926, p. 3231.

Pool and Dineen: Late Results of Gastroenterostomy for Gastric and Duodenal Ulcers Including Acute Perforated Ulcers. Annals of Surgery, October, 1922.

Porzelt: Das perforierte Ulcus pepticum jejuni in Gefolge des Zwœlffinger-darmgeschwürsdurchbruchs. Zentralb. f. Chirurg. N. 28, 1928.

Schwarz (Egbert): Ueber die operative Behandlung des perforierten Magen-und Duodenalgeschwürs und der Perforation des peptischen Jeju nalulcus nach Gastroenterostomie. Dtsch. Zeitschr. f. Chirurg. 192, 1926.

Schwarz (Franz): Die Behandlung der Freien Perforation des Magens und Zwœlffingerdarmgeschwüres und des Ulcus pepticum jejuni. Bruns' Beiträge zur Klin. Chirurg., 145, 1928.

Spath: Über das in die freie Bauchhöle perforierte Ulcus pepticum jejuni. Dtsch. Zeitschr. f. Chirurg., 205, 1927.

Speck: Zur Klinik und Pathologie der in die freie Bauchhöhle perforierten Magen-und Duodenalgeschwüre. Bruns' Beiträge zur Klin. Chirurg. 129, 1923.

Stincer: Las peritonitis por perforacion. Habana, 1927.

Urrutia: Sur le traitement opératoire des ulcères gastro-duodenaux perforés. Paris Chirurgical., May, 1923.

Wildman (W. Stanley): Jejunal Ulcer. Brit. Med. Jour., vol. ix, May, 1925.

Winkelbauer.: Zur Frage des post-operativen Ulcus pepticum jejuni. Arch. f. Klin. Chirurg., 140, 1926.

Wright (Garnett): Secondary Jejunal and Gastro-jejunal Ulceration. Brit. Jour. of Surgery., vol. vi, 1919.

RESECTION OF THE PROXIMAL DUODENUM AND PYLORIC SPHINCTER FOR MULTIPLE DUODENAL ULCERS

By Thomas Martin Joyce, M.D.

OF PORTLAND, OKEGON FROM THE PORTLAND CLINIC

ON JULY 7, 1924, during the performance of a Finney pyloroplasty for duodenal ulcer, a large, indurated posterior ulcer was found in addition to the calloused ulcer upon the anterior wall. It seemed futile to remove one ulcer only to leave another, and for this reason the duodenum was completely divided and about an inch and a half of the proximal end resected. This procedure removed both the anterior and posterior ulcers. In order to insure patency of the pyloric opening, about an inch of the stomach, including the entire pyloric ring, was removed with the ulcer-bearing duodenum. An end-to-end anastomosis completed the operation. This patient, a nurse, twenty-seven years of age, made an uneventful recovery and has had no further abdominal distress to date.

It was not until 1927 that we made extensive use of the pyloroplasty and consequently did not again have occasion to perform a similar resection of the duodenum until then. Beginning in 1927, whenever a suitable case was found, the method of pyloroplasty as described by Judd, was used in preference to any other type of resection for duodenal ulcer. When a single ulcer upon the anterior wall of the duodenum is encountered, the Judd pyloroplasty is ideal. All of our cases have made smooth recoveries and are, so far as we have been able to ascertain, cured. As our experience with the operation increased, however, we were forcibly impressed by the large number of multiple duodenal ulcers encountered. Judd 1 has reported the finding of multiple ulcers in but 0.71 per cent. of 4901 cases of duodenal ulcer in which operation was performed. These figures are based upon work at the Mayo Clinic between January 1, 1906, and January 1, 1921, or during a period in which little plastic surgery upon the duodenum was done. Consequently, a view of the lumen of the duodenum was not obtained in the great majority of these cases and undoubtedly a large number of posterior ulcers were missed. Fluoroscopy is unreliable in the diagnosis of multiple lesions, and negative röntgenological findings do not rule them out. Indeed, shallow posterior lesions by themselves may not give even the cap deformity, upon which the diagnosis of ulcer is most often made. The point we are trying to emphasize is simply that in all probability 0.71 per cent. is much too low for the actual occurrence of multiple lesions. In our own cases, though few in number when compared to these, two or more ulcers were found in a much higher percentage.

Of the fifty consecutive cases brought to the surgery for ulcer (gastric ulcer omitted) in 1927 and 1928, the operations performed were as follows:

THOMAS MARTIN JOYCE

Gastro-enterostomy	32- 64
Simple closure of acute perforation	2- 4
Polya resection for gastrojejunal ulcer	2- 4
Judd pyloroplasty	10- 20
Partial duodenectomy	4- 8
Total	50-100

In thirty-six cases the duodenum was not opened and but one ulcer was diagnosed. In the fourteen cases in which a view of the lumen was obtained, on the other hand, contact ulcers on the posterior wall were found in seven cases, or in 50 per cent. In two cases many lesions were present, five distinct ulcers in one case, and four in another. (Fig. 1.)

Posterior lesions in the first four cases were disregarded, the anterior



Fig. 1.—Section of proximal end of duodenum and pyloric ring removed by partial duodenectomy. Arrows point to the five indurated ulcers found in this specimen,

ulcer being removed with a section of the pyloric ring in the manner described by Judd. These patients did not do as well as usual. One case especially had persistent distress for months following the operation, and even today any slight indiscretion in diet will bring about a recurrence of pain.

Because of this unsatisfactory experience we determined to disregard posterior ulcers no

longer. A complete resection of the proximal end of the first portion of the duodenum, including the ulcerative lesions, and the pyloric ring of the stomach with end-to-end anastomosis is now done when possible in all cases of multiple duodenal ulcers. (Figs. 2, 3, 4.) This operation has been performed by us five times with complete and permanent cure in every case except one. Convalescence is smooth and the post-operative reaction slight compared with gastro-enterostomy, gastric resections, and other surgical procedures for the cure of lesions of the duodenum. There is apparently no more post-operative risk or shock than in the Judd pyloroplasty.

One of our cases died on the third post-operative day following the intravenous injection of faulty glucose solution by an inexperienced intern. Until the time of this unfortunate accident the patient, a man sixty-five years of age, with four indurated ulcers in the proximal inch and a half of the duodenum, had shown splendid progress. After the first twelve hours there had been no vomiting and little discomfort. As is our custom, we had given him water in small quantities for the first time on the morning of the third day, intravenous glucose being routinely employed in stomach cases the first three days. The glucose was given at 11:30 A.M. About twenty minutes later the patient had a severe chill and became very cyanosed. He soon lost consciousness. Because of the extreme anoxemia he was placed in the pneumonia tent

DUODENAL RESECTION FOR MULTIPLE ULCERS

and seemed to rally somewhat; but expired at 7 A.M. the following morning. Autopsy revealed an ante-mortem clot in the right pulmonary artery. The anastomosis between the stomach and duodenum was in perfect condition and undoubtedly had it not been for this tragic mishap the patient would have had an excellent result.

We think this operation solves a vexing problem, and, when indicated, is indispensable. Horsley 2 for some years has employed his pyloroplasty when-



F16. 2.—(a) Judd pyloroplasty partially completed showing anterior and posterior ulcers. (b) Method of resecting posterior ulcer—first step of partial duodenectomy, excision of posterior ulcer and pyloric ring.

ever possible in dealing with duodenal ulcerations, and during this time has been confronted repeatedly with the question of how to deal with posterior and contact ulcers. On two occasions he attempted to resect the posterior ulcer through the pyloroplasty opening on the anterior wall. Sutures were placed in the posterior wall to draw the edges together to close the space made by removal of the ulcer and to control hæmorrhage. Because of the small opening through which this work was done he was unable to control bleeding and these two cases ultimately bled to death. This very disastrous experience compelled Horsley to abandon this method of attack on posterior ulcers.

Many writers, especially the Europeans, during the last few years are advocating extensive gastric resection for duodenal ulcer. We feel that this is not a logical treatment of this problem. In the first place, partial gastric

6

d

THOMAS MARTIN JOYCE

resection in the best hands carries a mortality rate of from 6 to 10 per cent. Secondly, resection of the stomach as ordinarily performed does not remove the duodenal lesions, but even if, as has been recently advocated, a portion of the proximal duodenum is removed in a partial gastrectomy, we maintain this method as a primary operation to be unnecessarily extensive. Lastly, gastrojejunal ulceration, when it does develop following pylorectomy, is a far more appalling condition with which to deal than a recurrence of a

Fig. 3.—Second step of partial duodenectomy. Note that the semicircular incision widens the duodenum sufficiently to permit direct anastomosis to the stomach.

duodenal ulcer after resection of an inch or two of the duodenum.

There is no question in our minds as to the preferability of pyloroplasty to gastro-enterostomy in selected cases. Pyloroplasty in our experience is less dangerous. is followed by fewer recurrences, and the immediate post-operative reaction is infinitely milder. From the literature it is impossible to accurately estimate the percentage of recurrences to be expected following pyloro-

plasty. Reports by well-known surgeons vary from 2 to 13 per cent.^{3, 4} When present, recurrences after pyloroplasty may still be conservatively treated with a gastro-enterostomy but gastrojejunal ulcer usually must be dealt with by extensive gastric resection.

Gastro-enterostomy may be followed by other serious complications. The vicious circle dreaded since the first gastro-enterostomy by Wolfler, in 1881, is even today not a thing of the past. Occasionally, in spite of correct operative technic and painstaking care, the distal loop will become kinked and regurgitant vomiting will ensue, necessitating entero-enterostomy.

The adverse views which R. Lewisohn ⁵ of Mount Sinai expressed as to this operation by his report of 34 per cent. of gastrojejunal ulcers has failed in its apparent intent to frighten surgeons from gastro-enterostomy entirely. Indeed, many papers written since by no less authorities than Balfour, ⁶ Judd, ¹ Moynihan, ⁷ and other master surgeons expressly refute Lewisohn's statistics. Nearly all are willing to admit, however, that gastrojejunal ulcer is of more frequent occurrence than the heretofore accepted 2 per cent. In the large clinics where the operation is performed by expert surgeons under the most favorable circumstances, gastrojejunal ulcers occur in 3 to 5 per cent. of the reported cases. Throughout the

DUODENAL RESECTION FOR MULTIPLE ULCERS

country this percentage is undoubtedly much higher. Possibly the conservative estimate of Davis ⁸ (approximately 8 per cent.) is more nearly correct than the prohibitive figure of Lewisohn. At all events, gastrojejunal ulcer occurs with sufficient frequency and creates, when present, such a difficult problem, that for the avoidance of this complication alone surgeons will gladly accept any practical substitute for gastro-enterostomy.

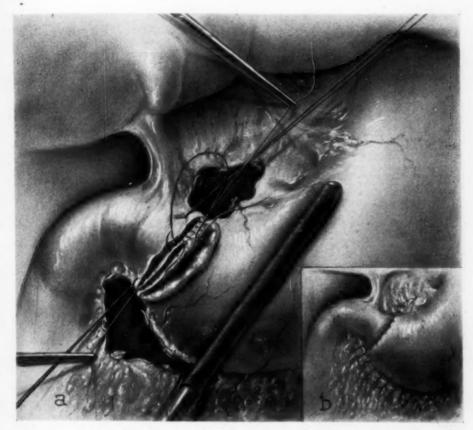


Fig. 4.--(a) Method of anastomosis. Three layers of sutures were used. (b) Operation completed.

As is readily seen, all these points favor pyloroplasty and operators in this country, following the leadership of Finney, Judd, Horsley, and others, are using this operation instead of gastro-enterostomy whenever possible. This is as it should be. We use the plastic operation for nearly every duodenal ulcer in which the duodenum is sufficiently loose to permit suture without tension. Where multiple or posterior ulcers are found, the entire ulcer-bearing area, usually the first inch of the duodenum and the pyloric sphincter, is resected. Any duodenum mobile enough to permit easy pyloroplasty can be resected in this manner without great difficulty. Gastro-enterostomy is still preferred for old stenosing ulcers, for ulcers acutely inflamed where the associated cedema

THOMAS MARTIN JOYCE

of the duodenum would make suturing unsafe, and for ulcers occurring in a relatively immobile duodenum.

Judd,¹ in writing upon the treatment of duodenal ulcers, makes the following statements: "Gastro-enterostomy results in healing, although not in every case. I do not believe the present wave of enthusiasm for resecting the stomach for duodenal ulcer will last very long. The best type of operation for duodenal ulcer is one that removes the ulcer and places the pyloric sphincter at rest."

When posterior ulcers are absent, the Judd pyloroplasty fulfills these re-

Fig. 5.—Röntgenogram of stomach and duodenum prior to operation. Note the poorly-filled, deformed duodenal cap.

quirements; when present, however, a partial duodenectomy, as described, must be done to satisfy these demands

What the ultimate outcome of this operation will be we cannot now state. We have only four cases that have been observed long enough to warrant the drawing of conclusions. The first case we did, four and a half years ago, as has been stated, re-

mains well to date. Rescreening these cases after a period of years reveals a practically normal condition. (Fig. 7.) The chief difference from the unoperated patient is the absence of the characteristic duodenal cap. (Fig. 5.) In spite of the complete removal of the pyloric sphincter by the operation, röntgenologically a mild sphincteric action is still observed. (Fig. 6.) Possibly the circular muscle fibres in this region may develop after a time into a true sphincter after the pyloric ring has been removed. Whatever the explanation of this phenomenon, spasm in every case is lacking and barium can readily be pushed from the stomach into the duodenum without force. For this reason we believe that if the muscles at the end of the stomach have become somewhat sphincteric in action, this is not pronounced enough to be detrimental.

We realize the scope of this operation is very limited, but it does provide a graceful exit from the embarrassing situation one faces when unsuspected contact ulcers are encountered in the course of the performance of a pyloroplasty. It has, therefore, a very definite place in surgery of the duodenum, but

DUODENAL RESECTION FOR MULTIPLE ULCERS

in spite of this fact there is very little reference to partial duodenectomy in the literature.

Balfour, 10, 11 in 1927, and again in January of this year, reported a practically identical operation except that he removes rather more of the stomach than we do. His method, in which seven to eight centimetres of the stomach is removed, is essentially a Billroth No. 1, which includes the ulcer-bearing

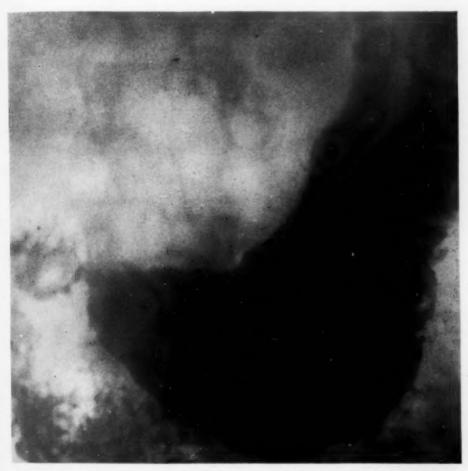


Fig. 6.—Two months after partial duodenectomy. A distinct sphincteric action in pyloric region of stomach may be observed, despite removal of the pyloric ring at operation. Ruge are still seen in the first portion of the duodenum, although a tendency to cap formation has already become manifest.

duodenum. It is our opinion that it is unnecessary to resect the stomach where the chief lesion is duodenal, except to remove the pyloric ring, and in this only does our method of resection differ from his.

Balfour recommends partial duodenectomy for multiple ulcers, calling attention to the fact that by this means the entire circumference of the duodenum is removed. He stresses the desirability of this operation in cases in

THOMAS MARTIN JOYCE

which the chief reason for surgery is repeated hæmorrhages. In the literature available to us we have found no reference to partial duodenectomy for mul-



Fig. 7.—Four and a half years after partial duodenectomy. A dilatation of the first portion of the duodenum simulating the normal cap is to be seen. Note relative absence of rugæ here. Sphincteric action in stomach empties without difficulty.

tiple duodenal ulcers other than the reports by Balfour. As we think it a logical and practical procedure in suitable cases, we add this report to his in an effort to interest the profession at large in this operation.

DUODENAL RESECTION FOR MULTIPLE ULCERS

BIBLIOGRAPHY

- ¹ Judd, E. Starr: Doudenal Ulcer. Northwest Medicine, vol. xxvi, p. 482, October, 1927. ² Horsley, J. Shelton: Surgery of the Stomach and Small Intestine, p. 182, D. Appleton
- and Co., New York, 1926.

a

- ⁸ Erdmann, John F., and Carter, R. F.: The Operative Treatment of Duodenal Ulcer with Special Reference to the Horsley Operation. Amer. Surg., vol. lxxxi, pp. 631– 636, 1925.
- ¹ Horsley, J. Shelton: Surgery of the Stomach and Small Intestine, p. 184, D. Appleton and Co., New York, 1926.
- Lewisohn, R.: Gastrojejunal and Jejunal Ulcers, J. A. M. A., vol. lxxvii, pp. 422-428, 1021.
- ⁶ Balfour, D. C.: Summary of Surgery of the Stomach and Duodenum in the Mayo Clinic during 1927. Proc. of the Staff Meet. of the Mayo Clinic, vol. iii, p. 59, February 22, 1928.
- ¹ Moynihan, Sir Berkley: Two Lectures on the Gastric and Duodenal Ulcer: A Record of Ten Years' Experience, Wm. Wood and Co., New York, 1923.
- ⁸ Davis, D. L.: Gastrojejunal Ulcers. Internat. Abst. Surg., pp. 177-180, 1921.
- Finney, J. M. T.: Surgery of Gastric and Duodenal Ulcers. Amer. Jour. Surg., vol. i, pp. 323-343, December, 1926.
- ¹⁰ Balfour, D. C.: The Management of Lesions of the Stomach and Duodenum Complicated by Hæmorrhage, J. A. M. A., vol. lxxxix, p. 1656, 1927.
- ¹¹ Balfour, D. C.: Partial Duodenectomy for Bleeding Duodenal Ulcer. Proc. of the Staff Meet. of the Mayo Clinic, vol. iv, p. 25, January 23, 1929.

HIGH VEIN LIGATION IN THROMBO-ANGIITIS OBLITERANS

A REPORT OF NINE CASES

By George W. Van Gorder, M.D.

OF PEKING, CHINA

(FROM THE DEPARTMENT OF SURGERY IN THE PEKING UNION MEDICAL COLLEGE)

THE treatment of thrombo-angiitis obliterans has been very unsatisfactory and a source of no little concern to the surgeon who so frequently has been forced by the failure of his therapeutic measures to admit defeat, and in desperation to sacrifice one or more limbs of patients suffering from this mutilating disease. Not knowing its cause, we have been obliged to combat its progress in indirect ways that are popularly spoken of as conservative methods of treatment. A review of the recent literature on this subject will show many such conservative methods which it is not the purpose of this paper to discuss and evaluate, but none has as yet yielded entirely satisfactory results and most of them have resulted in disappointment. These facts should not discourage us, however, from further trial of conservative measures, for despite occasional failure, they are gradually superseding high amputation in the treatment of this dreaded disease. Most surgeons who come into frequent contact with thrombo-angiitis obliterans will agree, I feel sure, that the day of high amputation as the operation of choice in this disease has passed. But we are still groping about in the dark in our search for the best form of conservative treatment, and until we are able to eradicate this disease by striking at its cause, we must go on searching for the surest method of treatment that will give relief of all symptoms in the shortest possible time.

It is interesting to observe that each new procedure that has been mentioned in the literature as a possible therapeutic measure has sooner or later fallen under condemnation until there is not one that is generally accepted as of distinct merit. Although this is true in respect to individual methods of treatment, there is, however, an underlying principle that is becoming more and more universally accepted by all surgeons, namely, the importance in this disease of the development of the collateral circulation. Meleney and Miller stressed this point, and showed definitely that a favorable outcome of the disease was dependent upon the production of an adequate collateral circulation. Later, Lewis and Reichert emphasized this same fact and at the present time, most writers agree that in cases of thrombo-angiitis obliterans the collateral circulation is the most promising key to the solution of the prevention of gangrene.

Following the recognition of this fact, a great deal of experimental work has recently been carried out to ascertain the best methods of assisting nature in producing as large a collateral circulation as possible. One of the first methods tried was that of reversal of the circulation by the production of an arteriovenous anastomosis. Reid ³ and his associates have shown that such

a condition gives rise to a marked increase in the collateral circulation of an extremity, but attempts to apply this principle in the therapy of human circulatory diseases have not been successful so far, as shown by the experiences of Wieting,4 Lilienthal,5 and Horsley.6 The last named author came to the following conclusion in regard to this procedure: "In impending gangrene due to organic disease of the artery of any kind, reversal of the circulation, i.e., artificial arteriovenous anastomosis, appears unjustifiable. It seems, however, that such cases may be materially benefited by merely ligating the femoral vein. This would tend to balance the circulation by obstructing the venous circulation and permitting the arterial blood in the capillaries to bathe the tissues a longer time than would be the case if the venous circulation were unobstructed. The operation, then, of ligating the femoral vein in threatened gangrene in the lower limb due to partial occlusion of the arteries appears to have a proper field. The resulting improvement should be as great as after any kind of arteriovenous anastomosis, and the operation is much simpler and less dangerous to the patient."

This idea of vein ligation, as recommended by Horsley, had previously been employed by Oppel, who in 1913 published favorable results from popliteal vein ligation in six cases of arteriosclerotic gangrene. Four years later, through the experimental work of Van Kend and the writings of Makins, Sehrt, Popping, and Tuffier, and Tuffier, and Tuffier, and the great fundamental principles of blood-vessel surgery became universally recognized, namely, that when the main artery to an extremity is suddenly severed or blocked, the resulting circulation of the limb will be greatly improved, and gangrene often prevented by the simultaneous ligation of the companion vein. It was also recognized at this time that the more proximal the occlusion of the artery the less likelihood of gangrene, because of the increased opportunity for the formation of a collateral circulation in the extremity. These great clinical observations have been sufficient in themselves to insure acceptance by the medical profession, although their explanation is still a matter of some uncertainty and dispute.

Recent experimental studies on this question have shown that the procedure of ligating the main vein simultaneously with the main artery of an extremity results in, (1) an increase in the venous pressure ¹³; (2) an increase in the volume flow of blood beyond the ligated artery ¹⁴; (3) an increased residual arterial pressure ^{8, 14, 15}; (4) an increase in the peripheral arterial circulatory bed, ¹⁵ and (5) a decreased incidence of gangrene. ^{18, 14}

Applying these findings to the problem of hastening the production of a collateral circulation in thrombo-angiitis obliterans, it seemed reasonable to the writer to employ this procedure of vein ligation as a therapeutic measure in these cases, even though the blood vessels of the extremity were pathological in certain areas and although the results of several previous investigators, who had ligated the femoral vein for this condition, were not striking.^{15, 16} For in thrombo-angiitis obliterans, we have a disease of the blood vessels in which arterial occlusion predominates. The veins, to be sure,

h

are also affected by the same pathological process, but their involvement is not nearly so extensive as that of the arteries, especially in the case of the great main vessels of the extremity. Thus with arterial blockage on the one hand resulting in an ischæmia, and only slight embarrassment of the venous return from the limb, a great imbalance of the circulation takes place which may be corrected by ligation of the main vein.

Vein ligation in the treatment of spontaneous gangrene has been favorably recommended by Opell,⁷ Stradin,¹⁸ Brooke,¹⁹ and Morton, but it has been the recent experimental work of Holman ¹⁴ that has rendered additional stimulus to this selected form of therapy and because of it the writer was encouraged in five cases of this series to ligate the external iliac vein instead of the femoral vein.

In addition to clinical observations on the progress of the local gangrene, in the later cases of this series the intradermal salt solution test was used as an index of the degree of impairment of the circulation in the limb. This test, which was originally devised by McClure and Aldrich and later used extensively by Cohen and Stern, is based on the principle that the affinity of the tissues for water is increased in proportion to the impairment of the circulation. In other words, it was found that salt solution injected intradermally disappears more rapidly from areas with deficient circulation than from areas in which the circulation is normal. The technic of injection, as given by the originators, is as follows: "Two-tenths cubic centimetre of an 0.8 per cent, aqueous solution of sodium chloride is injected intracutaneously under aseptic precautions. The needle is inserted sufficiently superficially so that the lumen is visible through the skin. The end point of the disappearance of the elevation can best be determined by palpation unassisted by inspection, since color changes seen about the point of injection may cause confusion. It is necessary to disregard the very small traumatic elevation that is occasionally produced just where the needle enters the skin. This may persist after the large elevation, due to the injected salt solution, has disappeared." The normal disappearance time for healthy individuals varies from thirty minutes in the region of the toes to fifty minutes in the region of the thigh. Should the salt solution wheal disappear before thirty minutes in the foot or before fifty minutes in the area of the thigh, the indication is that there exists an impairment in the circulation.

CASE REPORTS

CASE I.—C.H.T., a Chinese farmer, twenty-four years of age, was admitted to the hospital August 21, 1925, complaining of severe pain in the arch of the right foot, and especially in the region of the first metatarsophalangeal joint; there was also a feeling of cold and numbness in the right foot and muscles of the calf. One year before, his left leg had been amputated through the thigh for the same condition from which he was now suffering. Examination showed several small dark areas along the lateral border of the right foot, but no definite gangrene. Tenderness was obtained upon palpation over the medial and dorsal portions, and the foot felt colder than normal. There was no pulsation in the dorsalis pedis or posterior tibial arteries; and palpation of the popliteal artery

LIGATION IN THROMBO-ANGIITIS OBLITERANS

revealed no impulse. Pulsation of the femoral artery could be felt for a distance of only three centimetres beyond Poupart's ligament.

Operation.—August 24, 1925. Excision of a portion of the right femoral artery and right femoral and saphenous veins for thrombo-angiitis obliterans.

Procedure.—An incision over the course of the femoral artery was made at the apex of Scarpa's triangle. The vessels were exposed and found to be tightly bound up in inflammatory tissue. The artery was finally dissected free and found to be completely obliterated. Since it seemed useless to attempt a periarterial sympathectomy, the operator excised a segment of the artery and the vein together with the surrounding inflammatory tissue in order to completely interrupt all of the sympathetic nerve fibres. The saphenous vein was also ligated, and the wound was closed with interrupted fine silk sutures.

Post-operative Course.—The operative wound healed per primam. Pain was definitely relieved but did not disappear. The pathological report stated that there was a complete obliteration of the lumen of the artery. A diagnosis of thrombo-angiitis obliterans was made. The patient was discharged to his home, September 8, 1925.

Readmission.—The patient returned to the hospital one month later (October 3, 1925) showing beginning gangrene of his second right toe. The previous excision of a portion of his femoral artery and vein had apparently not benefited him. Advancing gangrene and continued discomfort had led him again to desire amoutation for relief.

Second Operation.—October 6, 1925. Amputation of the right lower leg (middle third). This procedure was carried out under spinal anæsthesia and without the use of a tourniquet. The stump failed to heal readily and was so painful that another amputation at a higher level was advised.

Third Operation.—October 15, 1925. Amputation through lower thigh.

Post-operative Course.—Pain disappeared following the second amputation and the stump healed by first intention. The patient was discharged to his home on November 3, 1925.

Comment.—From the therapeutic point of view this case was a distinct failure. High ligation of the right femoral vein, saphenous vein, and the obliterated femoral artery failed to stop the advancing gangrene, and only partially relieved the patient's pain, so that amputation through the mid thigh was finally necessary. With the femoral artery in this case already completely obliterated at Scarpa's triangle, a not uncommon finding in this disease, we might consider that nature had already performed a high ligation of the artery, thus establishing the condition which Lewis 24 and Theis 25 advocated in the treatment of thrombo-angiitis obliterans. In spite of the benefit that might have arisen from this, however, gangrene had continued to advance accompanied by extreme pain, for the relief of which the obliterated femoral artery was sectioned in the hope that by completely breaking the continuity of the sympathetic nerve fibres accompanying this vessel and thus placing the main artery at rest, the patient's pain would be relieved. At the same time the right femoral and saphenous veins were doubly ligated to balance the circulation of the limb.

All of these measures were attended by no improvement except a transient relief of pain. It is a question whether ligation of both the femoral and saphenous veins produced too great a stasis of blood, for in other cases of this series favorable results both in the relief of pain and in improvement of the gangrenous condition were obtained by high ligation of the femoral vein alone.

e

GEORGE W. VAN GORDER

CASE II.—C.F.C., a Chinese fortune teller, sixty-one years of age, was admitted to the hospital December 13, 1927, for the third time. On the two previous admissions he had had amputations of his left toes and left thigh for thrombo-angiitis obliterans. Since his last discharge from the hospital three years ago, he had been fairly free from pain in the extremities for two years, but about eight months before readmission, the old symptoms had begun to return, pain starting at the shoulders and radiating to his finger tips and starting in the right thigh and radiating to the toes of the right foot. For the past two months this pain in his leg had been unbearable and he had resorted to morphine for relief.

Physical examination at this time showed an ulcer over the right small toe. The tips of the middle and big toes of the right foot had been ulcerated and gangrenous but had healed leaving the toes a little short. There was an ulcer involving the side of the right thumb and the base of the nail. The nails of all the fingers and toes were atrophied. The tip of the left index finger had ulcerated away, shortening the finger a little. The right foot was cold and slightly swollen.

Examination previous to operation showed no pulsation of the arteries in the entire right lower leg. The right femoral artery, however, could be felt to pulsate fairly strongly; the right radial artery could not be felt. In view of the fact that the patient had already had his left leg amputated for this same disease, it was felt that every possible effort should be made to save the right foot which was already gangrenous and infected in the region of the little toe. Following Holman's idea ¹⁸ of the ligation of the corresponding vein of a limb proximal to the blockage of the artery, it was thought advisable to ligate the right femoral vein in this case.

Operation.—December 20, 1927. Ligation of the right femoral vein for thromboangiitis obliterans.

Procedure.—Under local anæsthesia, a linear incision was made over the course of the femoral vessels in Scarpa's triangle. Characteristic adhesions were present at the site of exposure, indicating that an inflammatory process was going on even at that high level. The artery seemed to be of normal size but its walls felt thickened and its pulsation was not as strong as normal. Between it and the femoral vein were some fairly dense adhesions which had to be cut in order to isolate the vein for ligation. The femoral vein was doubly ligated with medium silk, after which the wound was closed carefully in layers.

Post-operative Course.—The pain was definitely relieved following ligation of the femoral vein. The ulcerated areas of the toes slowly improved and in three months' time were completely healed.

Follow-up.—The patient was last seen on January 10, 1929, eleven months after ligation of the right femoral vein. There was no longer any gangrene and his wounds had remained completely healed since his discharge from the hospital eight months before. He walked with the aid of crutches and with only occasional slight discomfort in his second toe. Otherwise, there was no pain at all in the right foot or lower leg. In the upper extremities, the right radial pulse could not be felt, but the left one, which previously had been imperceptible, was faintly obtained.

Comment.—This case is the only one of this series that showed all of the extremities affected by the disease. Fortunately the formation of a collateral circulation had taken place in both arms to combat the impending gangrene, and the patient in the course of over ten years had lost only a small portion of several finger tips. According to the patient's story the right radial pulse had been absent since the first attack of brachial pain almost twenty years ago, and recent examination confirmed its absence. On the left side, however, it is of interest to note that a faint pulsation which was not present five years before, could now be obtained in the left radial artery, indicating that canal-

LIGATION IN THROMBO-ANGIITIS OBLITERANS

ization of a thrombus may have taken place or that blood had again found its way into this vessel at a point distal to the original blockade.

The lower extremities in this case failed to share the happier fortune of the upper ones, for advancing gangrene and extreme pain had driven the patient to beg for amputation of the left leg, which was performed three years ago through the mid thigh.

When the disease process later spread to the patient's right leg, and gangrene of his small toe became quite marked, ligation of the right femoral vein relieved his pain at once and furthered the healing of the wound so that it completely healed in three months' time, and remained so for almost a year. He now walks with this remaining foot and the aid of crutches with but slight discomfort.

It is interesting to speculate in retrospect as to whether or not a ligation of his left femoral or external iliac vein might have postponed the amputation or permitted it safely at a lower level of the limb, but vein ligation for this disease had not then been tried in our clinic and other conservative measures were of no avail. We can now say with some assurance that ligation of the vein would have relieved his pain and afforded at least temporary improvement of the local gangrene.

There is little question in my mind that ligation of the right femoral vein had a salutary effect in combating the advancing disease process and was in fact the means of preserving the patient's right lower extremity. Whether or not the result will be permanent is open to doubt, but in my experience with many cases of thrombo-angiitis obliterans among the Chinese, the procedure of high vein ligation has given the quickest and most hopeful results of all the conservative therapeutic methods now employed.

CASE III.—K.Y.C., a Chinese peddler, twenty-five years of age, was admitted to the hospital January 17, 1928. Eight months earlier, in this hospital, his left leg had been amputated at the upper thigh level for thrombo-angiitis obliterans, but the stump had refused to heal. Because of the persistent ulceration, associated with pain, it was thought that ligation of the external iliac vein might improve the circulation and thus hasten the healing process.

Physical examination showed a well-built young man with a high left thigh amputation stump ulcerated at its end. The ulcer was about the size of a quarter, looked indolent, and was slightly excavated. No definite pulsation of the left femoral artery could be felt, although at times there was a suggestion of pulsation. The vessels of the right leg appeared to be normal. Laboratory examination showed urine, blood and fæces to be normal, and a negative Wassermann reaction.

Operation.—January 20, 1928. Ligation of the left external iliac vein for thromboangiitis obliterans.

Procedure.—An incision four inches long was made just above the middle of Poupart's ligament on the left side, and carried down through the muscle layers exposing the peritoneum which was reflected upward. The vein was found to be uninvolved in the thrombotic process, but it was stuck tightly to the external iliac artery, and an attempt to separate it from the artery tore it and produced a brisk hæmorrhage which was, however, controlled with little difficulty. The external iliac vein was ligated in two places with heavy silk sutures. The external iliac artery was very small and cord-like and its pulsation was very feeble. Following ligation, pulsation of the vessel could not be seen

at the proximal ligature. It was questioned whether the artery also had by accident been included. The wound was closed in layers with interrupted sutures of fine silk.

Post-operative Course.—The operative wound healed by first intention. The ulcerated area remained practically stationary for several days and then showed signs of slow improvement. The patient was discharged from the Out-Patient Department March 10, 1928, at which time the ulcer measured only a few centimetres in diameter, but was not definitely healed.

Follow-up.—In January, 1929, one year after ligation, the patient wrote as follows concerning his condition: "I still have slight pain in my leg stump but not nearly so much as before operation. The ulcer is not yet healed, although it also is better than it was before operation."

Comment.—Amputation through the mid thigh was not sufficiently high to allow perfect wound healing in this case, and reamputation may eventually be necessary to accomplish this end. The condition of the external iliac artery as seen at operation could easily account for the failure of healing on the basis of scanty arterial blood supply. On the other hand, the external iliac vein, being patent, was emptying the limb of its blood without restriction, thus producing an imbalance of the circulation. It was hoped that ligation of the vein would, by impeding the outflow of blood, tend to equalize the arterial and venous circulations and afford a better blood supply for the healing area. This desired result has so far not been accomplished, for after a period of one year, we find the ulcer, although improved, still unhealed. In this case, then, we can say that high vein ligation greatly relieved the patient's pain and slightly improved the gangrenous condition, but has failed so far to secure wound healing.

Case IV.—C.C., a Chinese street hawker, forty-four years of age, was admitted to the hospital October 28, 1927, with a history of intermittent pain of twelve years' duration in his left great toe. Associated with this was a history of occasional limping, especially in prolonged walking, and of cramps in the left lower leg. These were very severe at night. The left foot had been hypersensitive to cold for the past six years, so that during sleep the patient was obliged to wrap it in extra bed clothes. Last winter an ulcer formed as a complication of an infection of a nail, and refused to heal, in spite of complete removal of the toe nail together with a small loose piece of bone. The patient was a rather heavy smoker, but took neither alcohol nor opium.

Physical Examination.—The general physical examination was not remarkable. Locally, the left lower extremity showed a purple discoloration of the great toe, absence of its nail, a trophic ulcer of the nail bed, slight decrease in the temperature of the limb, and an absence of palpable pulsation in the left dorsalis pedis, posterior tibial, and femoral arteries. The muscles of the calf of this leg also showed some wasting. Upon application of the sphygmomanometer to the left thigh, slight pulsation could be observed in the column of mercury, but no pulsation in the lower leg.

An intradermal salt solution test showed rapid absorption of the skin wheal in the left lower leg, as compared with the controls on the right leg.

Laboratory findings showed urine and blood to be normal. Stools contained ascaris ova. The Wassermann reaction was negative.

First Operation.—November 4, 1927. Ligation of the left external iliac vein for thrombo-angiitis obliterans.

Procedure.—An incision was made just above the middle of Poupart's ligament and parallel to it and carried down to the peritoneum, splitting the fibres of the external oblique muscle and dividing the internal oblique and transversalis muscles at their lower

LIGATION IN THROMBO-ANGIITIS OBLITERANS

edge. The spermatic cord was seen and displaced medially and the peritoneum gently reflected upward. This gave a good exposure of the external iliac vessels, and showed the artery to be a fibrosed cord-like structure and the vein to be distinctly larger than normal. Palpation of the artery revealed no pulsation and not until the operator's finger ascended to the bifurcation of the left common iliac artery could pulsation be felt. At this point the internal iliac and the common iliac arteries could be felt to pulsate. The main block existed therefore at the very beginning of the external iliac artery. To balance the circulation, the external iliac vein was doubly ligated with medium silk just distal to the main bifurcation; and immediately following ligation, that portion of the yein distal to the point of constriction, became greatly and almost alarmingly distended. At the same time, the left leg was examined by an assistant and showed a very striking picture. It was mottled everywhere with small dark blue and white patches, which, upon gentle stroking with the hand, seemed to fuse and then disappear, leaving the color of the limb slightly cyanotic. It was apparent that a great disturbance in the circulation of the leg was going on, especially in the area distal to the knee. The temperature of the foot remained satisfactory and at no time became cold. In fact the left leg felt somewhat warmer than it did before operation and was about the same temperature as the right.

Post-operative Course.—Following operation there was considerable swelling of the left leg, its circumference measuring four centimetres more than that of the right. Pain was also present and was not relieved either by elevation or by posture. The toe, in contrast, appeared less swollen than before ligation of the vein and its color returned to normal. On the tenth day after the operation, however, pain recurred in the toe and it was noted that there had been a definite ascent of the line of demarcation of the gangrene. Because of the increase of pain, it was thought that a ligation of the obliterated femoral artery might perhaps relieve the inflammatory process in the big vessel and thus give the patient some relief from the symptoms. The following operation was therefore carried out.

Second Operation.—November 28, 1927. Ligation and section of the left femoral artery.

Procedure.—Under local anæsthesia, the femoral vein, artery and nerve were identified at the apex of Scarpa's triangle, the two former being so tightly matted together that it was almost impossible to separate them. By careful, sharp dissection the artery was separated from the vein. It appeared very hard and cord-like, gave no pulsation, and its lumen seemed to have been entirely obliterated. Silk ligatures were tied at the upper and lower portions of the mobilized vessel, and a section of it, one and a half inches long, was removed for pathologic examination. The femoral vein was definitely dilated and was much larger than normal, this being probably due to the previous ligation of the external iliac vein. The wound was closed in layers by means of interrupted sutures of fine silk.

Post-Operative Course.—After operation, pain was temporarily relieved and the swelling of the left calf subsided. The operative wound healed per primam. Pathologic section of the vessel removed at operation showed the intima greatly thickened due to organization of a thrombus. Five days after operation, pain in the toe again recurred and it was decided to amputate it. The stump healed by first intention and the pain was greatly diminished. The patient was discharged from the hospital December 23, 1927.

Follow-up.—The patient was last seen on January 5, 1929, one year after operation, at which time a small ulcer persisted at the head of the first metatarsal bone of the left foot. The remaining toes of this foot showed a bright reddish discoloration and the patient said that they felt numb. The affected foot was not so warm as the other. There was no pain in the ulcerated area, however, either at rest or upon walking, but the calf muscles of the left leg experienced cramp-like pains on long standing or prolonged walking. Sleep was no longer interrupted by pain, and the patient was again carrying on his trade as a street hawker.

Comment.—This is the second case of this series, in which vein ligation

(in this instance, the external iliac) did not relieve the patient's pain. It is interesting to note that excision of a portion of the obliterated femoral artery produced only temporary relief, which lasted for five days, and that it was not until the gangrenous toe was amputated that pain definitely disappeared. The case is of interest also because of the marked disturbance in circulation that followed ligation of the external iliac vein. Aside from the immediate reaction, however, nothing unusual was noted in the course of convalescence, and the ligation and section of the femoral artery could have had little or no effect upon the circulation of the limb, since that vessel was practically obliterated by thrombus formation at the site of operation.

Although the immediate result in this case appeared to be somewhat disappointing, we find the patient one year later walking with his foot, carrying on his work, and free from pain, in spite of the presence of a small unhealed ulcer.

Case V.—L.M., a Chinese farmer, forty years of age, was admitted to the hospital May 16, 1926, complaining of pain and swelling of the left great toe. His trouble started two years earlier, when after a long walk of thirteen miles, he experienced great pain in this same toe. From that time on, long distance walking always precipitated pain which at times became almost unbearable and necessitated rest. One year before, the nail of this toe became infected and discoloration appeared as well as discharge of yellow fluid. The condition had grown progressively worse and of late it had confined the patient to his bed. The patient smoked and drank moderately.

Physical Examination.—The general physical examination showed nothing remarkable. Locally, the nail area of the left great toe showed ulceration with considerable exudate from the nail bed. The dorsalis pedis and posterior tibial pulses of both feet were not palpable. Sensation over the foot was normal.

Examination of the urine and blood showed no abnormal findings. Stool examination showed the presence of ascaris ova.

A diagnosis of thrombo-angiitis obliterans was made.

Operation.—June 25, 1928. Ligation of the left external iliac vein for thromboangiitis obliterans.

Procedure.—An oblique incision three inches long and just above the middle of Poupart's ligament was carried down through the muscle layers to the peritoneum which was not opened but was retracted upward exposing the external iliac vessels. The external iliac vein appeared to be considerably distended and the external iliac artery was patent and pulsating normally. Between the vein and artery were some adhesions which made a separation of the two vessels rather difficult. These adhesions were of the type characteristic of thrombo-angiitis, and it was only with the greatest care that the vein was separated from the artery without injury and doubly ligated with strands of heavy silk.

Following ligation, that portion of the vein distal to the ligature became greatly swollen and the operated leg was a little cooler than the other. There was, however, no marked disturbance of the circulation until half an hour later when the affected leg became cyanotic and its temperature became lower than that of the other leg. By elevating the leg and applying heat, the circulation was restored to normal and when the patient recovered from ether both limbs were the same color and temperature.

Post-operative Course.—The operative wound healed per primam and the pain in the left foot disappeared. One morth after operation, pain in the foot was absent when at rest, but slight pain was felt when the patient walked. The patient was discharged August 11, 1028.

Follow-up.—A letter dated September 3, 1928, three months after operation, stated that the condition of the foot was improving.

LIGATION IN THROMBO-ANGIITIS OBLITERANS

Seven months after operation the patient wrote that his wound was "dry" but his toe was a little swollen. There was slight pain, but much less than before operation.

Comment.—Following Holman's ¹⁴ theory of an increase in collateral circulation after proximal ligation of the vein, it was decided to ligate the external iliac vein in this case. Case IV of this series had had a similar operation performed with no untoward results. In this case the immediate circulatory reaction following ligation was not so great as in Case IV, but the patient's pain was immediately relieved. The wound of the great toe, however, did not show the distinct early improvement that was manifest in most of the other cases, but later, as shown by the follow-up report, the wound became dry and there was apparently no extension of the gangrene.

Case VI.—T.A.T., a Chinese farmer, twenty-nine years of age, entered the hospital July 6, 1928, with a chronic ulcer of his right foot, which had been present for several months and refused to heal. Associated with the lesion was extreme pain, which was worse at night. There was a past history of dry progressive gangrene of the second toe of the right foot and of four toes of the left foot, only two of which now remained. The gangrene of the left foot had required three years for healing. The patient smoked cigarettes occasionally.

Physical Examination.—The general physical examination was negative except for the lower extremities. Three toes were missing from the left foot and one from the right. There was an unhealthy sluggish looking ulcer at the base of the right great toe. The dorsalis pedis, posterior tibial, and popliteal pulses were not palpable on either leg, but pulsation of the femoral vessels was readily made out. Blood-pressure readings could not be obtained at either popliteal space, but were equal and readily observed in the arms.

Examination of the urine and blood showed no pathologic findings. Stools showed the presence of ascaris ova. The Wassermann reaction was negative.

A diagnosis of thrombo-angiitis obliterans was made.

Operation.—July 11, 1928. Ligation of the right external iliac vein for thromboangiitis obliterans.

Procedure.—Under ether anæsthesia, an incision was made parallel to Poupart's ligament on the right side and about half an inch above it. This incision was carried down to the peritoneum which was then reflected upward without opening into it. The external iliac vessels were readily isolated and were found to be involved in an adhesive process characteristic of thrombo-angiitis obliterans. The artery pulsated freely, but its wall was somewhat thickened. The vein appeared to be distended and was so firmly stuck to the artery that separation was difficult. Having successfully isolated a small portion of the external iliac vein, double ligatures of heavy silk were used to occlude the vessel.

The wound was closed in the usual way. There was no immediate circulatory reaction following ligation.

Post-operative Course.—Following operation the pain disappeared. The operative wound healed by first intention. An intradermal salt solution test was made July 21, 1928, for record. The following table shows the findings:

Site of Injection	Absorption Right	Time Left
Thigh (Upper 1/3)62	minutes 46	minutes
Thigh (Middle 1/3)61	minutes 63	minutes
Thigh (Lower 1/3)52	minutes 47	minutes
Leg (Upper 1/3)31	minutes 30	minutes
Leg (Middle 1/3)27	minutes 33	minutes
Leg (Lower 1/3)23	minutes 26	minutes
Dorsum of foot12	minutes 12	minutes

7

GEORGE W. VAN GORDER

July 23, a small remaining gangrenous area was removed from the right toe to encourage rapid healing. This was done under gas and oxygen anæsthesia, the distal phalanx of the right second toe being amputated. The patient was discharged to the Out-Patient Department on July 30 for further dressing of the granulating wound.

Follow-up.—Two months after operation the patient's pain had not returned and symptomatically he was greatly improved. The wound of the second right toe was clean and was granulating, but had not entirely healed. Seven months after operation his wound was again examined and found to be much improved, but not yet completely healed. He had no pain in his foot except upon long walking, i.e., distance of over one mile. He felt that his condition was steadily getting better.

Comment.—Ligation of the external iliac vein in this case yielded immediate relief of pain and definite improvement of the gangrenous condition of the toe.

CASE VII.—Y.C.J., a Chinese beggar, twenty-nine years of age, was admitted to the hospital July 14, 1928, with gangrenous stumps of both lower legs. Six months previously, when he had been commandeered by soldiers to act as a coolie in an army camp, he first noticed severe cutting pains in both feet, which came in attacks at irregular intervals. At the same time he had difficulty in keeping his feet warm and once, after soaking them in hot water, his toes became ulcerated and later gangrenous. The gangrene extended above his ankles and was accompanied by extreme pain. Three months later, after both feet had become black and dead, he himself removed them with a knife because of their offensive odor and an infestation with maggots. Severe pain had persisted in the stumps ever since.

Physical Examination.—The general physical examination showed nothing unusual, except the condition of the lower extremities. Both feet were absent, with three inches of black necrotic bone projecting from each ulcerating stump. There was foul-smelling discharge. Both knees were held in a position of ninety degrees flexion and could not be voluntarily extended. The lower legs appeared atrophied. A very faint popliteal pulse could be obtained on both sides and the pulse in both femoral arteries could be palpated without difficulty. It appeared, from the equal pulsation of the vessels on the two sides and the symmetrical gangrene, that both legs had been affected by the disease simultaneously and to the same extent.

Examination of urine, blood, and fæces showed no abnormal findings. The Wassermann reaction was negative.

Operation.—July 20, 1928. Ligation of the right femoral vein for thromboangiitis obliterans.

Procedure.—A longitudinal incision about three inches long was made over the right femoral vein in Scarpa's triangle. After the subcutaneous tissues and fascia were divided, the femoral artery was identified and was found to be pulsating well, but its wall was slightly thickened. The femoral vein was next readily identified and isolated. It was then doubly ligated with two strands of medium silk and the color of both stumps observed. Slight cyanosis of the right leg was seen to be present. The wound was closed in layers with fine silk.

Post-operative Course.—Following operation the pain in the right leg at once disappeared, and the operative wound healed per primam. The ends of bone projecting from the stumps had been removed on the ward, leaving flat ulcerating surfaces which began to heal. Reverdin skin grafts were applied to both stumps on the eleventh day after operation, and although only three-fourths of them remained alive, they eventually covered the entire granulating areas.

Because of continued pain in the left leg and stump, it was thought advisable to ligate the vein on that side also; and, on the basis of Holman's experimental work, ¹⁸ to tie it as high as possible. The left external iliac vein was therefore selected for ligation.

LIGATION IN THROMBO-ANGIITIS OBLITERANS

Second Operation.—August 17, 1928. Ligation of the left external iliac vein for thrombo-angiitis obliterans.

Procedure.—Under local anæsthesia an incision three and a half inches long was made parallel to Poupart's ligament and about one inch above it. This incision was carried down to the peritoneum which was reflected upward and not opened. The external iliac vessels were found without difficulty, the vein appearing distended and the artery appearing normal. The vein was separated from the artery by careful blunt dissection and although there were some sticky adhesions between the two vessels, these were not nearly as firm as those usually found in cases of thrombo-angiitis obliterans. After isolating a portion of the vein, it was ligated in two places by strands of heavy silk, after which the peritoneum was allowed to fall back into place and the wound was closed.

Immediately following the ligation of the vein, the color of the left leg became somewhat cyanotic and the superficial veins could be seen to be distended. The temperature of the leg did not differ very much, however, from that of the right.

Post-operative Course.—The patient's pain was relieved at once after ligation of the external iliac vein. The operative wound healed by first intention and he was discharged from the hospital August 29, 1928.

Second Admission.—The patient was admitted to the hospital a second time (September 20, 1928) for reamputation of the skin-grafted stumps, of which the right still showed a small area of ulceration. Physical examination revealed no new findings. Both femoral arteries were pulsating but the popliteal pulses were barely palpable.

Third Operation.—October 5, 1928. Reamputation of the stumps of both legs.

Procedure.—Under spinal anæsthesia the lower ends of the tibia and fibula on both sides were removed leaving a length of bone six inches below the tubercle of each tibia. Both wounds were tightly closed without drainage.

Post-operative Course.—Both stumps showed signs of a mild infection after operation, and the release of several sutures was necessary to control this condition. The wounds were completely healed after four weeks, when the patient was again discharged. The pathologic report of the specimens removed at operation was thrombo-angiitis obliterans of the left anterior tibial artery and some smaller blood vessels.

Comment.—Intradermal salt solution tests performed on this case are of special interest because of the fact that on the right side it was the femoral vein that was ligated while on the left it was the external iliac. If Holman's theory ¹⁴ of high ligation of the vein holds good in cases of thrombo-angiitis obliterans, one might expect in this case, in which the extremities appeared to be equally and symmetrically involved by the gangrenous process, a greater improvement in the collateral circulation of the left leg than in the right. The findings as shown below do not substantiate this, but indicate that the circulation was affected about equally in the two extremities. This may be due to the fact that although the two ligations were at different levels, the difference in the level did not include sufficient additional tributary vessels to warrant a fair comparison.

CASE VIII.—L.Y.S., a Chinese farmer, twenty-nine years of age, was admitted to the hospital August 20, 1928, complaining of severe pain in his right leg and foot, and in his left arm. These symptoms dated back three years, when for a period of six months he had had intermittent attacks of throbbing pain in these extremities. One year after the onset blisters appeared on his right great toe, and a little later gangrene developed for which the distal end of the toe was amputated. Healing was slow and imperfect, but was finally complete after a number of months. On admission, the

GEORGE W. VAN GORDER

amputated stump was hyperæsthetic and the patient was suffering extreme pain in the right foot and the left arm, which prevented both walking and sleeping. His personal habits were good. He was a moderate smoker.

Physical Examination.—The general physical examination showed nothing unusual except that the patient's mentality was somewhat below par. Arterial pulsation was

	Absorption time in minutes									
Site of Injection			Right leg	Left leg						
	Before opera- tion	Five days after opera- tion	Five weeks after opera- tion	Ten weeks after opera- tion	Four months after opera- tion	Before opera- tion	Eleven days after opera- tion	Six weeks after opera- tion	Three months after operation	
Leg (mid ½) Leg (upper ⅓)	17 37	52 44	30 44	15 50	8 50	15 28	34 56	27 40	5 50	
Thigh (lower ½) Thigh (upper ½)	44 57	35 70	49 57	54 59	50	44 57	60 60	55 55	50	

normal in all of the large vessels of the body with the exception of the left radial, the right popliteal and dorsalis pedis arteries where no pulse could be obtained. The right foot was slightly bluish as compared with the left and the right great toe was missing, its stump being covered by very thin skin which was sensitive to touch.

Blood-pressure readings were as follows: Left cubital space 110/70; right cubital space 116/78; left popliteal space 142/90; right popliteal space 122/78.

Examination of the urine, blood, and faces showed no pathologic findings. The Wassermann reaction was negative.

A diagnosis of thrombo-angiitis obliterans was made.

Operation.—August 24, 1928. Ligation of the brachial and basilic veins of the left forearm and of the right femoral vein for thrombo-angiitis obliterans.

Procedure.—Under brachial block anæsthesia the brachial vessels were identified in the upper arm and the two venæ comites of the brachial artery were isolated and tied. The median nerve was seen but was not disturbed. The basilic vein, located in the same area, was also ligated. In the thigh, under local anæsthesia, the femoral vein was isolated in Scarpa's triangle and was tied without difficulty. The brachial artery in this case appeared to be much narrowed and hardened and its accompanying veins were also small and adherent to the vessel in the way characteristic of thrombo-angiitis obliterans. Pulsation of the brachial artery was feeble. In the leg, the femoral artery showed no marked changes although its pulsation was weaker than normal. There were no definite sticky adhesions between the vein and artery at the area under observation. Following ligation of the above vessels the patient's pain was at once relieved and there was no marked disturbance of circulation in the limbs operated upon.

Post-operative Course.—Following ligation the pain disappeared both in the arm and in the foot for one week and then returned in the sensitive stump of the right great toe, but not in the arm. As the great toe was useless in its present state it was amputated one week later at the metatarsophalangeal joint. Primary healing resulted, but the pain was not relieved. Intradermal salt solution tests at this time (August 30, 1928) showed:

	Absorption Time						
Site of Injection	Right	Left					
Dorsum of foot 6	minutes (18)	45 minutes (50)					
Leg, lower half60	minutes (70)	60 minutes (55)					
Back of hand48	minutes (60)	33 minutes (44)					
Arm, lower half60	minutes (60)	60 minutes (60)					
(Figures in brackets represent	nre-operative	findings and are					

recorded here for comparison)

LIGATION IN THROMBO-ANGIITIS OBLITERANS

Follow-up.—Two months after operation, the pain in the patient's foot had decreased considerably. There was a slight sense of numbness in the fingers of the left hand, but no pain.

Comment.—The intradermal salt solution tests made at the time of this patient's admission to the hospital showed very definitely the sites of impaired circulation (i.e., the left hand and the right foot), which areas also corresponded exactly with the location of pain. The usual immediate relief of pain following vein ligation was experienced in this case both in the arm and in the leg, but for only one week, after which the pain returned. In view of the favorable results usually obtained, this fact is difficult to explain as well as the evidence of increased circulatory impairment shown by the intradermal salt solution test done six days after operation. It should be stated, however, that whatever pain the patient experienced subsequent to operation was never sufficient to deprive him of sleep, and never caused him to assume the characteristic sitting posture which patients with thrombo-angiitis obliterans usually assume when they are in great pain. The fact that subsequent amputation of the offending great toe was followed by primary healing of the wound also argues favorably for an improved circulation in the extremity.

CASE IX.—L.K.C., a Chinese merchant, thirty-four years of age, was admitted to the hospital December 10, 1928, complaining of ulceration of the right toe and pain in the right leg. This trouble had begun one year earlier with severe pain in the regions of the right thigh and calf. It was intermittent in character and was definitely associated with walking. He stated that after walking a short distance he was obliged to sit down and hold his right leg in an acutely flexed position during the attacks of pain. These attacks would occur intermittently through a period of two or three weeks at a time. Simultaneously with the onset of the pain, he noted a black area on the right small toe, which extended gradually until the toe finally dropped off, ten months previously. Five months before admission his right great toe also became gangrenous, and he entered a hospital in Honan, where, in the course of four and a half months, all of the toes of his right foot were amputated, but the wounds refused to heal. The patient used tobacco and alcohol in moderate amounts. He began to take opium four months before admission on account of the pain and at the time of admission he was taking about four grams a day.

Physical Examination.—Except for the local condition, the general physical examination showed nothing remarkable. The right leg could not be extended beyond 135° and was slightly thinner than the left. The right foot showed an absence of all toes with ulcerated areas over the metatarsal heads and on the dorsum of the foot over the first metatarsal bone. The granulations were sluggish and exuded some purulent discharge.

Examination of the right leg showed no pulsation in the dorsalis pedis, posterior tibial, or popliteal arteries. Both femoral pulses were feeble. The left popliteal and the posterior tibial pulses were barely palpable. The left dorsalis pedis pulse was absent. Both radial pulses were palpable.

Blood-pressure readings were: Right cubital space 110/60; left cubital space 110/60; right popliteal space (not obtained); left popliteal space 99/44.

Laboratory findings showed urine, blood and fæces to be normal, and the Wassermann reaction negative.

A diagnosis of thrombo-angiitis was made.

Operation.—December 14, 1928. Ligation of right femoral vein for thromboangiitis obliterans.

Procedure.—Under local anæsthesia a straight-line incision was made from Poupart's ligament distally in the line of the femoral artery. The deep fascia and the femoral

GEORGE W. VAN GORDER

sheath were carefully dissected free. The femoral vein was isolated from its accompanying artery and doubly ligated with medium silk just above the entrance of the profunda branch. The femoral artery was small and thickened but still pulsated. The wound was closed with fine silk.

Post-operative Course.—The operative wound gaped a little after removal of the sutures but remained clean. The patient had no pain after operation and the wounds of the foot improved rapidly.

Intradermal salt solution tests made before and after operation showed the following findings:

	Absorption time in minutes								
Site of injection		Right leg		Left leg					
	Before operation	Five days following operation	One month following operation	Before operation	Five days following operation	One month following operation			
ThighLeg (upper ½)Leg (lower ½)Dorsum of foot	50 46 13	42 27 5	40 31 27 10	61 50 19	48 35 16 6	54 43 31 5			

Comment.—Pain was relieved at once and the patient's wound showed remarkable improvement following ligation of the right femoral vein. The intradermal salt solution test also indicated an improved circulation in the foot. At the time of discharge from the hospital the therapeutic result, though not a cure, was gratifying.

Summary of Findings in this Series of Cases

Case No.	Hospital number	Age	ge Sex		To-	Pulsation of vessels						
					Disease duration	bacco his- tory	Fem- oral	Pop- liteal		Dor- sal pedis	Vessel ligated	Relief of pain
1	5585	24	male	3 years	Yes	+	0	0	0	Rt. femoral vein Rt. saphenous vein Rt. femoral artery	No	No
2	6974	61	male	10 years	Yes	+	0	0	0	Rt. femoral vein	Yes	Yes
3	16856	25	male	4 months	?	?	0	0	0	Lt. ext. iliac vein	Yes	Yes
4	18445	44	male	12 years	Yes	0	0	0	0	Lt. ext. iliac vein Lt. femoral artery	No Later yes	No Later yes
5	20373	40	male	2 years	Yes	?	?	0	0	Lt. ext. iliac vein	Yes	No change Later yes
6	20864	29	male	3 years	Yes	+	0	0	0	Rt. ext. iliac vein	Yes	Yes
7	20971	29	male	6 months	Yes					Rt. femoral vein Lt. ext. iliac vein	Yes Yes	Yes Yes
8	21349	29	male	3 years	Yes	+	0	0	0	Lt. brachial vein Lt. basilic vein Rt. femoral vein	Yes No	Yes Yes
9	22559	36	male	ı year	Yes	+	0	0	0	Rt. femoral vein	Yes	Yes

SUMMARY

Nine cases of thrombo-angiitis obliterans have been reviewed, in which conservative treatment, consisting of high ligation of the main vein of the

extremity, was employed. In five of these cases the femoral vein was ligated at the apex of Scarpa's triangle, and in five cases the external iliac vein was tied just distal to the bifurcation of the common iliac. In two instances obliterated femoral arteries were sectioned, in addition to the vein ligation, in the hope of alleviating pain. In one case ligation of the left basilic and brachial veins was performed, and in one case the saphenous vein was ligated along with the femoral vein.

The results in the five cases of femoral vein ligations were definite improvement in three (*i.e.*, disappearance of pain and cessation of gangrene); cessation of gangrene, but slight residual pain in one; and complete failure to relieve symptoms in one.

The results obtained in the five cases having external iliac vein ligations were definite improvement in three cases (i.e., disappearance of pain and cessation of gangrene); complete relief from pain but no change in the gangrenous condition in one case; and no immediate improvement in one case. This last mentioned case (Case IV) received no relief of pain from the vein ligation nor from the arterial section, which also severed his sympathetic nerve fibres, and it was not until the tip of his gangrenous toe was removed, one week later, that he felt free from discomfort. One year after vein ligation he was still free from pain.

The results in the two cases in which section of the obliterated femoral artery was performed in addition to vein ligation, in order to relieve pain, were failures, indicating that periarterial sympathectomy may be of no avail in the treatment of this disease.

Ligation of the basilic and brachial veins in one case was successful both in relieving pain and in improving the circulation of the extremity.

The one case in which the saphenous vein was tied along with the femoral vessels (Case I) resulted in failure, and amputation was performed.

In these nine cases treated by high ligation of the vein, we find marked improvement in six, some improvement in two, and no improvement in one.

The criticism may be offered that a certain amount of local improvement might have resulted because of hospital care alone, without any specific form of therapy, but it has been our experience in the past in this clinic that there was little or no improvement in these cases until amputation was performed. If Miller and Kaufmann are right in their suggestion that ligation of the femoral vessels acts only to relieve pain and in no way tends to assist mechanically in the development of the collateral circulation, it is difficult to explain the improvement of the local gangrenous condition in this series of cases, which has been in marked contrast to the improvement in cases not thus treated. It would appear therefore that if the disease process is arrested, even though temporarily, following high vein ligation, the most reasonable explanation is on the basis of an improved collateral circulation.

No attempt is made in this paper to explain the beneficial results of high ligation of the vein in thrombo-angiitis obliterans other than on the basis of establishing a balance of circulation in the extremity.

le

We know that the arterial blood supply of a limb affected by this disease is impeded from reaching its most distal portions by patchy areas of thrombus formation, thus producing, in case of extensive disease, death of the affected part due to ischæmia. This occlusion of blood vessels is much more extensive in the arteries than in the veins, as is shown by many instances of complete obliteration of the femoral artery, a condition never found, so far as I know, in the main veins of the limb. In exploring the large vessels in these cases we commonly find a diseased or obliterated main artery, surrounded by dense perivascular adhesions, but a patent and normally functioning vein. The arterial inflow of blood is diminished in proportion to the extensiveness of the thrombotic process, while the venous outflow appears to be scarcely restricted at all. Thus the limb readily empties itself of blood and there is no increased resistance or back pressure to encourage collateral circulation from the remaining normal arteries.

High ligation of the main vein under these circumstances offers a marked resistance to the outflow of blood and an increased venous and capillary pressure, which in turn should direct a greater volume of collateral blood from the normal arteries of the limb into anastomosing channels that will eventually reach the distant capillary bed. This is the desired end, for, until we discover the cause of this mutilating disease, our only hope in overcoming its ravages is the production of a sufficient collateral circulation. As Meleney and Miller ¹ have previously pointed out: "A contest develops in this disease between two forces, blockage of vessels on the one hand, and collateral bloodvessel development on the other, and the outcome is determined by the relative speed of the two processes."

This attempt to help nature in the production of a collateral circulation is at best an indirect method of attack against the disease, but if it can succeed in conveying blood to parts which are dying simply for lack of it, pain will have been relieved and gangrene prevented.

In evaluating the results of high vein ligation as a conservative therapeutic measure in the treatment of thrombo-angiitis obliterans, we are led to believe from this series of cases that the procedure is of definite value in affording relief from pain, in combating impending or advancing gangrene, and in postponing if not obviating high amputation.

CONCLUSIONS

- High ligation of the vein in the treatment of thrombo-angiitis obliterans is justified, and is to be highly commended.
- Of nine cases of this disease treated by this method, pain was controlled, and gangrene arrested or improved, in eight.
- 3. Ligation of the external iliac vein does not appear to have any marked advantage over ligation of the superficial femoral vein in Scarpa's triangle, so far as could be determined by post-operative clinical observation in this series of cases.

LIGATION IN THROMBO-ANGUTIS OBLITERANS

4. Of all the forms of conservative treatment employed in this clinic for thrombo-angiitis obliterans, high ligation of the vein appears to be by far the most promising.

BIBLIOGRAPHY

- ¹ Meleney, F. L., and Miller, G. G.: A Contribution of the Study of Thrombo-angiitis Obliterans. Annals of Surgery, vol. lxxxi, p. 976, 1925.
- ² Lewis, D., and Reichert, F. L.: Collateral Circulation in Thrombo-angiitis Obliterans: Indication for Ligation of Femoral Artery Just Distal to Profunda. J. A. M. A., vol. lxxxvii, p. 302, 1926.
- ⁸ Reid, Mont R.: Studies on Abnormal Arteriovenous Communications, Etc. Arch. of Surg., vol. xi, p. 25, 1925.
- Wieting: Deutsche Med. Wchnschr., vol. ii, p. 1217, 1908.
- ⁶ Lilienthal, H.: Annals of Surgery, vol. xlv, p. 1, 1907.
- ⁶Horsley, J. S.: A Study of Reversal of the Circulation in the Lower Extremity. J. A. M. A., vol. lxiv, p. 873, 1915.
- 7 Oppel: Zentralbl. f. Chir., vol. xxxi, p. 1241, 1913.

1

1

n

e

g

e

11

 \mathbf{d}

11

d

11

18

11-

ed le, nis

- Van Kend, M.: Compt. rend, Conf. Chir. Interall, p. 348. Paris, 1917.
- Makins, Sir George: (a) Hunterian Oration. Lancet, vol. i, p. 249, 1917; (b) Gunshot Injuries to the Blood Vessels, New York, William Wood, 1919.
- ¹⁰ Sehrt, E.: Ueber die Künstliche Blutleers von Gliedmassen und unterer Korper Halfge, sowie uber die Ursache der Gangran des Gliedes nach Unterbindung der arterie allein. Med. Klin., vol. xii, p. 1338, 1916.
- ¹¹ Propping, K.: Ueber die Ursache der Gangran nach Unterbindung grosser Arterien. Munchen med. Wchnschr., vol. 1xiv, p. 598, 1917.
- ¹² Tuffier, Th: A propos der plaies des arteres. Bull. et. mem. Soc. de Chir. de Paris, vol. xliii, p. 1469, 1917.
- ¹⁸ Brooks, Barney, and Martin, K. A.: Simultaneous Ligation of Vein and Artery: An Experimental Study. J. A. M. A., vol. lxxx, p. 1678, 1923.
- Holman, Emile: Observations on the Surgery of the Large Arteries. Annals of Surgery, vol. lxxxv, p. 173, 1927.
- Holman, E., and Edwards, M. E.: A New Principle in the Surgery of the Large Arteries. J. A. M. A., vol. lxxxviii, p. 909, 1927.
- ³⁵ Pearse, H. E., Jr.: A New Explanation of the Improved Results Following Ligation of Both Artery and Vein. Annals of Surgery, vol. lxxxvi, p. 850, 1927.
- ¹⁶ Ginsberg, N.: Gangrene in Thrombo-Angiitis Obliterans. Amer. Jour. Med. Sc., vol. cliv, p. 328, 1917.
- ¹⁷ McNealy: The Place of Elective Vein Ligation in Blood Vessel Surgery. Surg., Gynec. and Obstet., vol. xl, p. 45, 1925.
- ¹⁹ Stradin, P.: Deutsche Ztschr. f. Chir., vol. cxciv, p. 289, 1926.
- ¹⁹ Brooke, R.: Periarterial Sympathectomy with Ligature of the Femoral Vein in the Treatment of Diabetic Gangrene. Brit. Jour. Surg., vol. xv, p. 286, 1927.

RECONSTRUCTION OF THE HIP-JOINT IN CONGENITAL DISLOCATIONS

By WILLIAM JACKSON MERRILL, M.D.

OF PHILADELPHIA, PENNA.

The finding of sad results from methods that have not been productive of requisitely substantial bone building after acetabular reconstruction lead to the thought that a displacement *in toto* of the malformed acetabulum would be more satisfactory. Bone chips or frail segments have often failed, when a transposed acetabulum undisturbed in structure and innate function would have succeeded.

Functional results of this operation cannot be given here but since the mechanics of the operation have been carefully tested and advantages evinced,



it seems to be opportune to give a preliminary report of a measure in hip-joint reconstruction which the author has employed in a few cases.

Four years ago, when reconstructing a hip-joint, a frail, thin ilium was encountered. There was three inches shortening, and an almost vertical pitch to the acetabulum. The writer proceeded as follows: A U-shaped incision was made around the upper half of the deformed acetabulum. The ilium was so frail that it seemed best to turn down both tables. On account of the wide discursion of the head and the

threatened pressure of it in the new acetabulum after reduction, the rectangle was completed to include the entire shallow diminutive acetabulum. This was displaced obliquely outward and upward and tilted outward over the femoral head. It was made fast by sutures and became a solid part of the ilium.

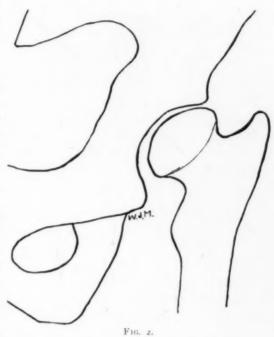
With this case as a stimulus the writer experimented on the cadaver to study the mechanical behavior of a segment of the ilium including the upper portion of the brim, as compared with frail pieces of bone from the ilium or elsewhere, the continuity of which is always more or less disturbed. The

CONGENITAL HIP-JOINT DISLOCATIONS

writer's object was to move the segment outward and tilt it outward, which on account of its shape would move upward a little. Dr. Paul N. Jep-

son assisting in the experimentation suggested that it be moved outward and distinctly upward.

A rectangular section was made including the roof and half of the floor. This was displaced upward and outward and tilted outward, eliminating encroachment upon the acetabulum and extending the roof well out over the femoral head. Often bone chips and frail segments do not produce resistant bone and the "breaking down" of the roof causes encroachment on the already diminutive acetabulum, and relative shortening of the roof, moreover, the impingement of it on the femoral head tends to force the



latter outward. Figure 1 illustrates the difficulties of replacement and maintenance of reduction.

WJ.M.

F1G. 3.

Figure 4 denotes the method by which the writer strives to secure a robust acetabulum. The segment is made by a transverse incision, far enough above the margin of the acetabular brim to obtain bone of proper integrity; two vertical incisions, completely through ilium, one anterior and one posterior in similar

cure head, easily dislocated when bloodless reduction is accomplished.

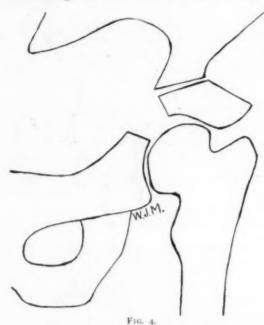
Figure 3 demonstrates the incomplete roof when any

Figure 2 shows the inse-

Figure 3 demonstrates the incomplete roof when any method has failed to carry a substantial roof well out over the femoral head.

WILLIAM JACKSON MERRILL

relation with the brim as the upper transverse cut; and a fourth transverse cut through the centre of the floor. This rectangular segment is displaced



upward and outward and tilted outward. The upward movement should be the least possible to minimize shortening. This outward and upward displacement of the roof facilitates reduction. The writer has found that the ilium at the site of the acetabulum, in congenital dislocation of the hip-joint, is often frail and comparatively thin. When it is, a transverse section is practical. When it is not, a segment of the ilium, deep enough to insure robust bone, undisturbed in continuity, is easily obtained.

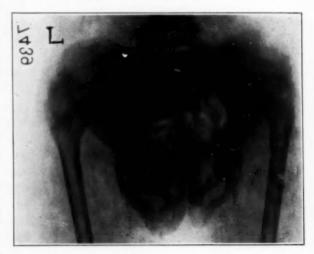
Preceding this operation the writer puts the patient to

bed with traction to the limit of toleration for a time sufficient, months if necessary, to accomplish complete relaxation and stretching of the soft parts

of hip and thigh, to favor a comparatively easy reduction and to minimize the pressure of the femoral head in the new acetabulum after reduction.

The moderate shortening in the unilateral cases is of less importance than the results of undue stress in handling, and pressure when the femoral head is forced and held at a lower level.

After the operation abduction, as indicated in



F1G. 5.

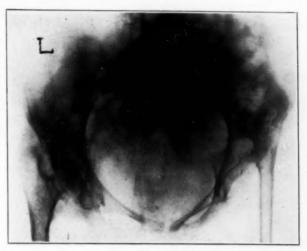
each case, is maintained until the X-ray indicates that the bone will withstand weight-bearing stress without undergoing absorption. This is maintained by plaster bandages, followed by an abduction walking brace until the stability and integrity of the joint are assured, even for a period of five years

CONGENITAL HIP-JOINT DISLOCATIONS

after operation. Many mechanically successful operations are vitiated by undue pressure and too early function. Function is commenced as indicated

and gradually increased, the results being noted by frequent X-ray studies. The leg is not brought to the mid-line until the conditions of the joint structures are satisfactory.

Figures 5 and 6 are of an X-ray of a bilateral case which the writer treated by manipulation. The head of the left femur was reduced on first attempt and remained in situ. Two futile attempts were made at bloodless reduction of the right, but



F1G. 6.

reduction could not be maintained. The most recent displacement operation by the author was on this case, right hip. Traction to the limit was made for over nine months, facilitating the certain steps in the operation and the reduction as well as augmenting maintenance of position.

This operation is presented with the belief that it is productive of a better-formed, more robust acetabulum, assuring a higher degree of stability and function than has heretofore been obtained by other methods.

TRANSPLANTATION OF URETERS FOR IRREPARABLE BLADDER INJURY

By W. Lowndes Peple, M.D. of Richmond, Va.

Mrs. H. N. C., age twenty-five, was admitted to St. Luke's Hospital, Richmond, Va., August 1, 1926. At the time of her marriage about a year and a half ago she was an active healthy young woman, about five feet two inches in height, and weighing 110



Fig. 1.—Condition prior to operation, showing hole in floor of bladder, absence of urethra, and complete perineal tear into the rectum.

She became pregpounds. nant, and went to term without any untoward incident arising. Prior to delivery she was found to have a moderately contracted pelvis, but this was not thought to be enough to preclude a natural delivery. She went into labor May 15, 1926, when according to calculation she was two weeks overdue. To quote the attending physician: "The membranes ruptured very early and after a rather long labor with very slow progress the occiput presented posteriorly, and all attempts to correct it ended in failure. A podalic version was done, as gently as possible, but with great difficulty on account of the early loss of the water. The delivery of the head and shoulders was extremely difficult, though a double episiotomy was done, and the work was carried on as gently and as slowly as seemed advisable with a patient badly shocked and bleeding rather freely. The delivery was finally completed without any apparently great mutilation to the baby or the mother. A small tear was noted in the floor of the bladder and an almost complete tear in the perineum. Immediate repair was not

attempted on account of the patient's condition of severe shock. She later developed an infection; sloughing started in the pelvic tissues, and it looked as if everything in this area would slough away.

TRANSPLANTATION OF URETERS

"About seventeen days after delivery she developed a complete paralysis of the right side of body, as a result of an embolus to her brain. When the sloughing ended it was found that practically the whole floor of the bladder and the urethra had sloughed away."

She came to St. Luke's Hospital August 1, 1926, directly from the hospital in which she had been delivered after a stay there of three and a half months. She weighed then

105 pounds, though she looked pale and anæmic. She had fully regained her speech and she could walk a little with assistance, and was using her right arm and hand fairly well, though her movements were slow and spastic. She had 3,600,000 red cells with hæmoglobin 65 per cent. Her Wassermann was negative. Her temperature was 90°, but it was very variable, jumping up with slight exciting causes. Her pulse was about 80 but ran up under excitement to 110. She had not menstruated since her delivery.

Vaginal examination revealed a complete perineal laceration, well up into the rectum. The sphincter was torn and separated, and there was little or no control left. The cervix could scarcely be made out, because of the scar tissue involving it. There was a hole in the vault of the vagina about an inch and a half in diameter. Its edges were hard and unyielding. It was just behind the pubic arch and was bounded laterally by the rami. was no vestibule. The entire urethra was gone. The mucosa under the arch was tightly attached to the perios-



Fig. 2.—Patient after perineorrhaphy with restoration of the

teum. The mucosa of the collapsed upper wall of the bladder bulged through the opening and presented in the vagina. The skin about the vulva and nates and anus was red and excoriated from the urine and feces constantly passing over it. Life was made tolerable by the frequent change of napkins and pads and the constant free use of soothing dusting powders.

Since the urethra and its sphincter, as well as the tissues in which it should lie, were missing, any effort at rehabilitation of the bladder would manifestly be futile. It was decided, therefore, to implant the ureters into the bowel. But, as the rectum was also open and its sphincter divided, it was again plainly necessary to restore it to competency first, for with urine pressing against it from above, if the ureters should first be implanted, healing would be difficult if not impossible.

W. LOWNDES PEPLE

Accordingly, September 3, a perineorrhaphy was done, suturing the torn rectum and approximating its sphincter and the vaginal mucosa over it. The operation was made difficult because of the brawny inelastic nature of the tissues after so much sloughing and subsequent inflammation, and the irritation of the urine and bowel excretions constantly bathing them.

As a preliminary step the ureters were catheterized and the catheters left in place to try to maintain a dry wound. This was not satisfactory, however, for the urine came

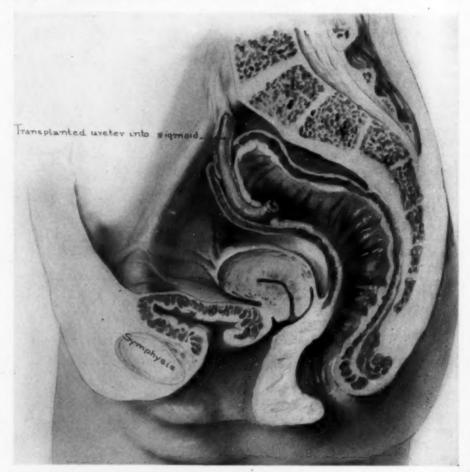


Fig. 3.—Sagittal view of the pelvis showing opening in floor of bladder, and right ureter implanted into the sigmoid.

around the catheters and flowed over the wound, and we only succeeded in setting up a pyelitis with a high temperature which took several days to subside.

The result, though cosmetically imperfect, was practically excellent, because it gave her a continent rectum.

She was sent home now for six months, to allow her to build up, to further recover from her paralysis, and above all to allow her to become cognizant of the altered social relations to those about her. She had been in hospitals continuously since her first illness, and most of the time in bed, with no opportunity to mingle with people other than her family.

She returned to St. Luke's April 5, 1927, having gained in weight and strength. She could now walk about without help and could use her hand quite well. She had

TRANSPLANTATION OF URETERS

perfect control of her anal sphincter and was quite comfortable in that respect. She had commenced going out among people and after trying some strap-on urinals had gone back to cloths and pads again, and was now quite ready for any operation that would render her condition less intolerable. One other feature had been added to the case. Shortly after leaving St. Luke's, about October 10, 1926, she began having slight convulsive seizures starting in the right side of the face and in the right arm and leg with muscular twitching, a slight Jacksonian epilepsy. These were controlled well with small doses of luminal.

April 7, 1927, a median section was done. The uterus was small and in good position and freely movable. The right ovary was large and cystic and the appendix was subacutely inflamed. The left ovary was normal. The appendix and the right ovary and tube were removed and the left tube ligated and divided to avoid the possibility of any future pregnancy. The right ureter was then implanted into the sigmoid, choosing a coil as low down as it could be had to lie easily against the right pelvic wall. The technique was that described by Dr. Charles H. Mayo in his operation for extrophy of the bladder. We followed this in close detail except that a preliminary catheterization of the ureter was done to make its location easy and convenient. This step I would earnestly commend to any occasional operator. The saving of time and unnecessary trauma will greatly outweigh the danger of infection. The steps of the operation, the curved incision along the longitudinal band, the puncture of the mucosa and the threading back of one end of the catgut traction suture into the cut ureter, to insure patency of its lumen, the covering of the ureter with the muscular and serous coats, were all quickly and easily accomplished.

Except for a rather severe febrile reaction following the operation the patient made a good operative recovery. Urine appeared in the rectum in about thirty-six hours; apparently about half the output. To be sure the kidney was functioning we gave indigo carmen intravenously and quickly recovered it through a catheter in the rectum. Control of the rectal sphincter with the added factor of irritating urine from above was complete and satisfactory. She held it from four to six hours and voided easily, with little burning or irritation.

April 25, eighteen days after the first operation, we did the second ureteral implantation. As there was no suppuration in the first incision which was median, we went through it again, thus leaving only one scar.

I would again emphasize the value of the ureteral catheter in situ as a guide in quickly locating the ureter, for I feel that the second operation would have been very difficult without this aid.

There was far less reaction from the second than from the first operation, and her control of the added urine in the rectum was prompt and complete. She went from two to four hours from the first, and at times did not have to void all night. There was a slight mucous secretion from the bladder, but this seemed to give little trouble. She left the hospital May 20.

In a letter received from the patient November 15, in reply to one from me in which I asked certain specific questions as to her present condition, I learned that her general condition is most satisfactory. The attacks of muscular spasm now come on the first day of menstruation, which has been re-established. They last only about five minutes and are very slight in character. She goes two or three hours without voiding in the day, and rarely gets up at night. The control of the urine is perfect and there is no irritation about the rectum or anus. The mucus from the bladder is very small in amount and gives no trouble whatever.

BRANCHIAL CYSTS OF THE PAROTID GLAND

BY WILLIAM F. CUNNINGHAM, M.D.

OF NEW YORK, N. Y.

FROM THE FIRST SURGICAL DIVISION OF BELLEVUE HOSPITAL

THE cystic and solid tumors and sinuses which arise in the region between the parotid gland and the manubrium that develop from the remains of bran-

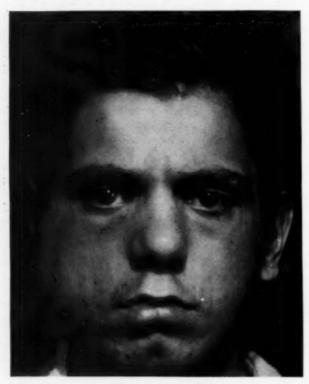


Fig. 1.—Front view showing right side enlargement in parotid region.

chial clefts or the organs which arise from them have two histological characteristics, an epithelial lining and a wall containing lymphoid tissue. The solid tumors occurring in the anterior triangle of the neck, such as branchogenic epithelioma, are not always attended by such lymphoid development and it is, therefore, often difficult to determine whether they arise from branchial remains or are of metastatic origin. Certain cysts that develop in the parotid gland are characterized by a lining of stratified columnar epithelium and a wall containing lymphoid tissue. These cysts may be sin-

gle or multiple and may undergo inflammatory changes with the production of sinuses similar to those springing from thyroglossal and branchogenic remains.

The parotid glands develop from the ectodermal oral sinus portion of the mouth as an epithelial growth. Menetrier ¹ has shown that the parotid glands of the fœtus and the new-born consist of lymphoid tissue with acini irregularly distributed through it.

Menetrier ¹ describes a tumor that was the size of an egg with multiple cyst formation removed from the parotid region. The lining was thrown into folds and covered by stratified columnar epithelium while the matrix was richly provided with lymphoid tissue. He refers to this as a parabranchial cyst in

BRANCHIAL CYSTS OF THE PAROTID GLAND

contradistinction to those cysts which arise directly from the remains of branchial clefts. Lecene ² reports two unilocular cysts of the parotid gland of similar morphology and refers to two others in the literature. Chevassu ³ describes a cyst of the region of the manubrium with a stratified columnar epithelial lining and a wall composed of lymphoid and salivary gland tissues.

Houdard 4 refers to a multilocular parotid cyst, but the morphology is typical of a papillary cyst adenoma and has considerable lymphoid tissue distributed through it. Two unusual cysts are reported by Peyron 5 that were removed from the carotid region. The walls contained Hassalls corpuscles indicating that they developed from a rudiment of the thymus gland. Thus it appears that there may be wide variations in the structure of these branchial remains depending on the pouch or bar from



Fig. 2.—Lateral view showing three sinuses.

which they arise. The following case is of interest because of the confusion it offered when first presented for diagnosis, because of the rarity of this type of lesion and because it is amenable to no treatment other than total or subtotal sialo-adenectomy:

CASE REPORT

History No. 6911, First Surgical Division, Bellevue Hospital. The patient, sixteen years of age, was admitted February 2, 1928, with the history of a swelling in the right parotid region of over three years' duration. The mass opened spontaneously on several



Fig. 3.—Showing stratified columnar epithelium.

WILLIAM F. CUNNINGHAM

occasions and discharged purulent material for a time. The patient was operated on for double otitis media and mastoiditis in 1925. Otherwise the patient has enjoyed good health,

Physical examination was negative except for bilateral chronic otitis media and the local condition. There was a hard mass involving almost the entire parotid gland with three stomata discharging seropurulent material. On pressure the same sort of material could be forced through Stenson's duct. A tentative diagnosis of tuberculosis of lymph nodes with parotid extension or actinomycosis was made. The smear, however, was negative for ray fungi although it contained microörganisms morphologically resembling pneumococci. Biopsy was done, the tissue being taken from one of the sinuses and this revealed a chronic inflammatory process.

Operation.—April 3, 1928. Pathology.—(1) Linear red scar from biopsy. (2) Three sinuses emitting purulent material. (3) Enlargement of parotid gland with chronic pro-

ductive inflammation and multiple small cavities with welldeveloped walls.

Procedure.—(1) Excision of two sinuses and previous scar through transverse incision. (2) Identification of facial nerve. (3) Excision of lower two-thirds of parotid gland by sharp dissection. (4) Closure of wound by a subcuticular suture of plain catgut.

The operative diagnosis was cystic degeneration of parotid gland.

Microscopical Examination by Dr. A. P. Stout.—"The sections Figs. 3 and 4 have been stained with ponceau, acid fuchsin, aniline blue and Regaud's hematoxylin; with metanil yellow, acid fuchsin and Regaud's

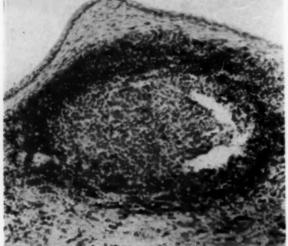


Fig. 4.-Showing lymphoid follicle in wall of cyst.

hematoxylin; and with Mayer's mucicarmin. These show that the cysts are lined with a stratified cuboidal and columnar epithelium beneath which are masses of lymphoid tissue. The salivary gland tissue surrounding them is imbedded in thick masses of fibrous tissue. The cells lining the cysts in a few places are covered on their surfaces with flecks of mucus, but none is seen within the cell body. The salivary gland acini also show some flecks of mucus in one or two places."

On April 20, 1928, patient was allowed to go home. There was at the posterior angle of wound a sinus discharging a small amount of seropurulent fluid. (There was no evidence that the facial nerve had been traumatized.)

SUMMARY

Certain solitary and multiple cysts develop in the parotid gland that are of branchogenic origin. The differential diagnosis may be made from an histological study of the lining cells. Solitary cysts are easily enucleated but the parotid gland, which is the seat of multiple cysts, necessitates total or subtotal sialo-adenectomy.

BRANCHIAL CYSTS OF THE PAROTID GLAND

BIBLIOGRAPHY

- ¹ Menetrier, Peyron and Surmont: Sur un case de kyste epitheliolymphoide du cou. Bull. de la Ass'n Fran. pour l'etude du Cancer, vol. xii, p. 205, 1923.
- ² Lecene: Revue de Chirurgie, vol. xxxi, p. 1, 1908.
- 3 Chevassu: Revue de Chirurgie, vol. xxxvii, p. 411, 1908.
- ⁶ Houdard, M., and Hufnagel: "Kyste amygdaloide a revetement cylindrique." Bull. de la Ass'n Fran. pour l'etude du Cancer, vol. xvi, p. 377, 1927.
- ⁵ Peyron, et al: Bull. de la Ass'n Fran. pour l'etude du Cancer, p. 370, June 15, 1914.

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY AND THE PHILADELPHIA ACADEMY OF SURGERY

JOINT MEETING HELD FEBRUARY 13, 1929

DR. FRANK S. MATHEWS in the Chair

TUBERCULOSIS OF THE THYROID GLAND WITH SECONDARY LYMPH NODE INVOLVEMENT

Dr. Carl Eggers, of New York, presented a woman, thirty years of age, who was admitted to the Lenox Hill Hospital, June 7, 1926, complaining of swellings in the neck associated with pain. She had been well until a year before when she developed occasional sharp pain in the right side of neck which did not yield to treatment. About six months later the thyroid gland began to enlarge and soon after enlarged lymph nodes began to appear on the right side of the neck. The pain had become worse, was constantly present, and radiated to the teeth and right ear. There were no other symptoms of constitutional disease. She was married and had one healthy child. Her menstruation was normal.

The patient was a well-developed, fairly healthy-looking woman. She weighed 122 pounds. The general examination showed nothing grossly abnormal. The outstanding feature was an enlarged thyroid and a chain of enlarged lymph nodes on the right side of the neck. Both lateral lobes of the thyroid were enlarged, they were nodular and unusually hard, and quite tender to touch. The pulse rate was increased to ninety, and there was tremor of the hands, but there were no other symptoms or signs of hyperthyroidism. The posterior chain of lymph nodes on the right side of the neck was enlarged, the glands felt very hard and were not adherent to the skin. The basal metabolism rate was +23. The blood count showed 4.032,000 red blood cells with 81 per cent. hæmoglobin; leucocytes 8200 with 61 per cent. polymorphonuclears. The urine was negative.

At operation the affected lymph nodes were removed first through a fourinch incision along the posterior border of the sternocleidomastoid muscle. The entire chain of nodes was removed in one mass, beginning the dissection below the mastoid.

A subtotal thyroidectomy was then done, leaving only a small portion of soft thyroid tissue posteriorly. There was very little bleeding. The gland tissue on section looked pale and rather fibrous. It was very hard.

The convalescence was uneventful and both wounds healed by primary union.

The pathological examination showed chronic tuberculous lymph adenitis and chronic tuberculosis of the thyroid gland. The following is a detailed microscopic report submitted by Dr. F. D. Bullock:

Sections of several of the nodes show discrete and confluent tubercles in a good state of preservation, and large caseous areas surrounded by epithelioid cells and scattered tubercles. There is considerable fibrosis of the nodes and fibrous thickening of the capsules.

Sections of the thyroid show the thyroid tissue to be divided up into lobules of different sizes by bands of dense fibrous tissue. The interlobular stroma is increased in amount and the parenchyma is mostly atrophic. Both the interlobular and intralobular fibrous tissue show an infiltration of many small round cells. Scattered here and there through the gland are giant cells and collections of epithelioid cells which sometimes surround multinucleated giant cells. There is no evidence of malignant disease.

The patient subsequently developed enlarged lymph nodes in the right supraclavicular fossa which were removed, May 21, 1928, and were also reported to be tuberculous. Except for this she has remained well. At no time have there been symptoms or signs of tuberculous involvement of the lungs or any other organ.

Tuberculosis of the thyroid gland is a rather rare condition. The more acute form is usually found in general systemic tuberculosis and appears as miliary tubercles throughout the gland. It is of little interest to the surgeon.

The more chronic type may appear in an otherwise normal gland or in a gland showing other pathological changes such as adenomata. One may find tuberculous granulation tissue, caseation, abscess formation or fibrosis, depending on the severity of the infection, the length of time it has existed and the resistance of the patient to the infection. Surrounding structures may become involved, and frequently the lymph nodes draining the gland become affected. The presence of tuberculosis in the gland usually tends to hyposecretion from pressure on the normal tissue rather than to hypersecretion. Subtotal thyroidectomy performed before the disease has spread to surrounding structures offers a good prognosis.

GASTROTOMY FOR HÆMORRHAGE FOLLOWING GASTRO-ENTEROSTOMY

Doctor Eggers presented a man, twenty-nine years of age, first seen by him October 16, 1928. He had symptoms of duodenal ulcer on and off for ten years, and for the last four years had been under competent medical care. In spite of this the condition recurred every few months. Each attack lasted three or four weeks. His chief complaint was pain, coming on either before or after meals. Sometimes it was relieved by eating. He also complained of nausea, but there was no vomiting. Lately he had been failing, and he had lost eight pounds during the preceding month. Gastric analysis and X-ray examinations had repeatedly been done corroborating the diagnosis of duodenal ulcer.

After admission to the hospital his gastro-intestinal series was repeated, and showed constant deformity of the duodenum without retention. A test meal showed high acidity. Blood examination and Wassermann were negative.

meal showed high acidity. Blood examination and Wassermann were negative.

Operation was performed October 26, 1928. The stomach was about normal size. Its prepyloric region was red in color. About half an inch below the pylorus a chronic ulcer was visible on the anterior surface of the duodenum. It was not particularly infiltrated, but had produced decided narrowing of the lumen with dilatation of the duodenum above, suggestive of a diverticulum. A short loop posterior gastro-enterostomy was done, using chromic catgut for the inner and silk for the outer suture. Special care was used to ligate the small vessels on the stomach and gut before incising the mucosa. The operation was smooth and satisfactory. There was no bleeding. The stomach was fastened into the slit in the transverse mesocolon and the abdomen then closed. Patient left the table in very good condition.

About two and a half hours later he vomited a small quantity of blood which was attributed to oozing from the suture line. No special attention was paid to it, and a hypodermic of morphine ordered. After that he vomited several times, each time a large quantity of blood, both fluid and clotted, amounting to approximately 1600 cubic centimetres in all. He failed rapidly, looked shocked, perspired profusely, and his pulse was small and thready, 130–140 per minute. The abdomen was again opened seven hours after the gastro-enterostomy. A transfusion had been ordered in the meantime but there was difficulty finding a donor. Though several donors of the same blood group were brought to the hospital, the blood of none of them matched and it was not until the next day that a transfusion from the patient's brother could be given.

A hypodermoclysis of Ringer's Solution was started before the operation was begun. When the wound was reopened, the abdomen looked clean and the organs were in normal position. The stomach was not dilated and showed good tone. (He had vomited just before operation.) A gastrotomy was done by a vertical incision through the anterior wall of the stomach, directly opposite the gastro-enterostomy. The blood within the stomach was removed by suction and the stoma was then inspected by everting its margins. At first no bleeding point was noted, but after allowing the tissue to relax, active bleeding was found along the posterior margin of the stoma. The blood was bright red, evidently arterial in character, but there was no spurting, perhaps due to an overlying fold of mucosa. Several mosquito clamps were quickly applied and six or seven fine chromic catgut sutures were inserted until the field was completely dry. The gastrotomy wound was then closed and the stomach replaced. Abdomen closed without drainage.

During the operation an infusion of 550 cubic centimetres of Ringer's Solution was given. The patient was badly shocked and active stimulation was resorted to. When it was impossible to get a donor another infusion of glu-

cose solution was given later.

The progress during the first few days after operation was slow, but with stimulation and subcutaneous administration of Ringer's Solution he gradually improved until a few days later he again began to vomit, had sunken eyes and a distended abdomen. Acute dilatation of the stomach was diagnosed and after a gastric lavage with the evacuation of enormous quantities of greenish-brown fluid definite improvement set in. He gained rapidly and was discharged four weeks after operation. He has remained well and his pre-operative gastric symptoms have cleared up. Röntgen-ray examination shows good function

with emptying through the stoma complete after two hours.

Vomiting of a small quantity of blood or blood-stained fluid after a gastro-enterostomy is not uncommon and is no doubt usually due to oozing from the suture line. It may at times be due to oozing from the ulcer resulting from manipulation at the time of operation. It usually stops spontaneously. Real hæmorrhage is uncommon. The speaker had seen it only twice. In his very first case of gastro-enterostomy it came on about twenty-four hours after operation. The second case was the one now reported. In the former the bleeding was controlled by gastric lavage, with hot saline solution containing adrenalin, and the administration of medication aimed at favoring clotting of blood. By keeping the stomach empty and allowing it to contract the bleeding ceased and he made a good recovery.

In the present case administration of coagulen had no effect, and transfusion could not be used for its blood clotting properties because of the inability to find a proper donor. Moreover the bleeding was so active and the patient failed so rapidly that it seems his life was saved only by the direct attack on

the bleeding point.

Dr. Arthur E. Billings, of Philadelphia, remarked that Doctor Schwartz had reported eight instances of hæmorrhage in a series of 398 cases following simple gastro-enterostomy, an incidence of nearly 2 per cent. Three of these cases died giving a mortality of slightly less than 1 per cent. In the April, 1928, issue of Surgery, Gynæcology and Obstetrics, Dr. William L. Estes, Jr., of Bethlehem, Penna., reported two cases similar to Doctor Eggers' case. Active bleeding occurred a few hours after operation. He operated on both of them, invaginating the line of anastomosis through the stoma into the stomach and suturing with chromic catgut. Both cases recovered.

PYONEPHROSIS WITH SUPERNUMERARY KIDNEY

In cases where frank hæmorrhage of several ounces of bright red blood occurs a few hours after operation, surgical intervention is demanded. The use of clamps as a routine procedure has been sacrificed by a number of surgeons for simple traction and suture whereby the active bleeding points in the line of anastomosis can be treated by direct ligature. The speaker emphasized the value of one point in the technic of gastrotomy and that was the use of the Cameron light. It is of distinct advantage in some cases where the stomach is to be explored for a bleeding point.

PYONEPHROSIS, LEFT, WITH SUPERNUMERARY KIDNEY AND URETER

Dr. James I. Russell presented a woman, twenty-four years of age, who was admitted to hospital with a ten-day history of pain in the upper lumbar and left costo-vertebral region, of rather sudden onset, increasing in severity the first few days. For several days prior to admission symptoms had somewhat subsided. She had previously felt perfectly well; past history entirely negative, no boils, no carbuncles, nor tonsillitis.

On admission Temp. 102.8°, white blood count 12,400; polymorphonu-

clears 69 per cent., and a moderate degree of secondary anæmia.

There was a firm, large and comparatively fixed mass in the left upper quadrant of the abdomen, extending down to the iliac crest. It was not particularly tender. It was dull on percussion, the dullness extending upward to the left nipple. The tympanitic colon was in front of the mass.

Voided specimens of urine contained large quantities of pus, but this was apparently largely contamination, as, with one exception, catheterized specimens rarely showed many pus cells. The patient, however, had not previously

noted any purulent vaginal discharge.

She was kept under observation for some time, temperature ranging from 100 to 103 degrees, during which time a thorough search for tubercle bacilli in the urine was being made. On two separate cystoscopic examinations clear urine was obtained from both kidneys and was sterile when cultured. The left ureter was obstructed by partial angulation opposite the fourth lumbar vertebra. Pyelogram showed point of obstruction near the kidney pelvis with marked dilatation of the proximal half of the ureter.

The second pyelogram showed a massive dilatation of the upper half of the left ureter and the left kidney pelvis with a marked ptosis of the pelvis.

Blood culture, Widal and Wassermann were all negative. Blood chemistry was essentially normal. No tubercle bacilli could be found.

She was given a blood transfusion and operated upon during the second week in the hospital (December 17, 1928), with a temperature slightly higher

than previously.

Through an oblique lumbar incision a large cystic mass was encountered, apparently within the parenchyma of the kidney, containing about one and one-half quarts of thick yellow pus. There was a veil-like tissue in the lower portion of this which shut it off from a large dilated ureter which extended down posteriorly over what proved to be a normal kidney. After evacuating the contents and dividing the large dilated ureter the cyst wall was dissected out. The lower portion of this was attached to the upper pole of an apparently normal kidney, which had its own vessels and separate ureter, and which was removed with the cyst wall.

Convalescence was normal. Vaginal examination failed to disclose any evi-

dence of aberrant opening of the ureter.

Microscopically.—The renal tissue removed from the intact lower kidney showed normal picture. All the sections of the dilated upper sac showed its walls to be composed of a mass of chronic inflammatory tissue in which could be detected renal tubules. The section of ureter enabled one to detect all of its layers, throughout which there had been a dense invasion by lymphocytes and plasma cells.

The patient was discharged from the hospital on the twenty-seventh postoperative day entirely free from symptoms. She has gained weight and

strength; and is now in good health.

Dr. Leon Herman, of Philadelphia, considered Doctor Russell's case to be an instance of incomplete reduplication of the ureter, commonly called double pelvis. In these cases there is rarely external evidence of the reduplication in the form of grooves or depressions in the parenchyma dividing the organ incompletely into two segments. Rarer still is there complete separation, in which event the smaller segment constitutes a supernumerary or accessory kidney.

The minor degrees of incomplete reduplication of the upper ureter and pelvis are commonly encountered by the cystoscopist and offer several problems in diagnosis. First, in the event that the catheter tip is introduced into the healthy portion of a double pelvis, the other portion being diseased, it is possible on this account to be misled by the normality of the urine obtained, and to overlook the disease. Furthermore, one may be misled concerning renal function, the catheter draining only one-half or less of the kidney.

In more advanced states of reduplication, there is likely to be more decided separation of the segments of the kidney drained by each ureter, and while rarely performed successfully the operation of heminephrectomy must be considered. The failures with the operation are attributable in some instances to disease, such as tuberculosis, but more often to technical difficulties among which the impossibility of isolating the ureters due to their residence in a common sheath, or an impossibility of preserving the blood-vascular supply to the healthy segment, is important.

Among a series of more or less complete ureteral reduplications, only one was heminephrectomized successfully. This patient, a girl eighteen years of age, had complete reduplication of the left ureter, normal upper segment and pyonephrotic lower segment of the left kidney, and a ptosed hydronephrotic right kidney. The latter showed less function to phthalein than the upper normal segment of the left kidney and seemed unable to support life unaided. For this reason, operation on the left kidney was feared lest nephrectomy should prove necessary. This became imperative, however, and heminephrectomy was successfully performed. The remaining segment of the left kidney is now a better functioning organ than the right kidney. The operation was quite easy owing to the fact that the main vessels were attached to the healthy segment and the ureters widely separated. This is one of the rare exceptions to the usual practice. As conditions encountered in Doctor Russell's case show, total nephrectomy is necessary in most instances.

CARCINOMA OF CÆCUM

CARCINOMA OF CÆCUM—INTUSSUSCEPTION

Doctor Russell presented a man, forty-six years of age, who was admitted to hospital, January 2, 1926, with a complaint of irregular, cramp-like pains in the right lower quadrant of the abdomen of eight months' duration, coming on following a herniotomy. He had been considerably constipated since the onset of his symptoms, but otherwise he felt well. There was no nausea or vomiting. He had lost thirty-eight pounds in weight during the past eight months. He had taken large amounts of morphine to keep free from pain.

An indefinite mass could be palpated beneath the recti muscles in the centre

of the abdomen. It was fairly well fixed and somewhat tender.

He was suffering from a moderately advanced degree of secondary anæmia. White blood count 11,200; polymorphonuclears 86 per cent. Blood chemistry was essentially normal. He had no fever. Urine was negative.

Barium enema showed partial obstruction in the proximal portion of the transverse colon and the edge of a moderately enlarged liver. Character of

obstruction was not determined.

Exploratory laparotomy was performed January 7, 1926. This revealed a chronic intussusception of the cœcum and ileocæcal junction into the transverse colon, apex being nearly over to the splenic flexure. The intussusception was reduced by manipulation without injury to the gut wall. An intra-intestinal tumor could then be felt in the cæcum. The cæcum was brought up into the wound and anchored with stitches.

Four days later the cæcum was incised. A pedunculated tumor was found projecting into its lumen: its pedicle was divided and the tumor removed and the defect in the cæcal wall closed by sutures. The attachment of the pedicle

was found to be below the level of the ileocæcal valve.

The pathological specimen consisted of a very firm, ovoid mass 4x3x3 cubic centimetres in size, roughened on its surface. Cut section showed a hard, whitish, fibrous-looking mass, covered on the surface by softer grayish tissue, infolded in areas.

Microscopic examination showed areas of normal-looking glandular mucosa, considerable fibrous tissue stroma; in places typical solid masses and cords of invading epithelial cells; definitely carcinomatous in nature. No mitotic figures were seen. Two weeks later a third operation was performed consisting of an enterocolectomy, lateral anastomosis. Four centimetres of terminal ileum and fifteen centimetres of the cæcum, ascending colon, were removed and showed no evidence of malignancy in either gross or microscopic examination. Lateral anastomosis was effected between the terminal ileum and the ascending colon.

The patient was discharged on February 19, twenty-five days post-operative, with the wound well healed after very moderate suppuration. There was no fæcal leakage. Bowels are now normal without catharsis. He has gained

weight, digestion is good.

Dr. John H. Jopson, of Philadelphia, said that polypoid tumor of the intestine is a well-recognized factor in intussusception. In one of the speaker's cases, an infant, the starting point of an ordinary ileocæcal type was in Meckel's diverticulum which intussuscepted, and by traction on the small intestine started up an ordinary type of intussusception. As to the technic, he understood that Doctor Russell first did an enterostomy, and then removed the malignant tumor, a two-stage operation. On the right side the speaker was in the habit of doing a one-stage operation for carcinoma, except in the presence

of acute obstruction. Where obstruction is present the technic of course is different. In left-sided cases he still practiced resection and anastomosis in two or three stages by the Mikulicz procedure, whether obstruction was present or not; and with much satisfaction as regards operative mortality.

CARCINOMA OF THE TONSIL AND ADJACENT TISSUES

Dr. Franz Torek, of New York, premised the presentation of two patients by saying that so much had been said about radium in the treatment of carcinoma of the oral cavity that a presentation of the subject from a purely surgical standpoint seems to be in order, especially as surgeons are learning to appreciate the dangers connected with the use of radium. His remarks would be confined to one phase of the subject, carcinoma of the tonsil, because its operative removal presents not only all the difficulties met in other parts of the oral cavity but probably some additional ones. Thus far it had not been his good fortune to meet with a case of carcinoma of the tonsil in which the affection was confined to that organ, hence the heading "Carcinoma of the Tonsil and Adjacent Tissues". Thus, in the case of the two patients whom he had selected for demonstration, one recent case and one nearly four years old, the carcinoma had extended from the tonsil to the tongue, the soft palate, the pharvnx, and the soft parts covering the lower jaw. In one of the two, the recent case, the resection of the soft palate extended beyond the uvula, and not only the glossopalatine arch but also the pharyngopalatine arch on the affected side had to be resected.

The lesion usually presents itself as a superficial carcinomatous ulcer with an exceptionally firm and immovable substructure. As a rule the deep jugular lymph nodes are involved, especially those at the confluence of the common facial vein and the internal jugular. They represent the first station for receiving the lymph from the mucous membrane of the base of the tongue and the anterior and lateral parts of the pharynx. Though enlarged, they are not always carcinomatous, the pathologist occasionally reporting only a hyperplasia. Then there is a group at the lateral side of the internal jugular vein, which receives the lymph from the mucous membrane of the lateral and posterior parts of the pharynx. A third group is a chain along the jugular vein from the point where it receives the facial vein down to the place where the omohyoid muscle crosses its course. This chain is sometimes very sparse, sometimes denser; it usually receives the lymph from the preceding groups but sometimes directly from the lymph sources mentioned before, without first going through the other groups. From this chain the lymph passes into the venous system at the junction of the jugular and subclavian veins. A group of lateral deep nodes in the region of the scaleni and the trapezius and, finally, the supraclavicular group are not involved directly, but may be involved secondarily from one of the preceding groups. If the lesion extends to the floor of the mouth, the submaxillary and submental lymph nodes may also be involved.

The removal of the deep jugular lymphatic nodes at the confluence of the facial and internal jugular veins and the group of nodes to the outer side of

CARCINOMA OF TONSIL

the internal jugular vein higher up is imperative, and it is advisable to remove also the chain along the jugular vein down to the point where it is crossed by the omohyoid muscle. In cases where the lesion encroaches on the floor of the mouth the submaxillary and submental nodes should be removed if they are enlarged. This was done in the two cases shown.

The operation begins with the lymph-node dissection, after which the external carotid artery is tied beyond its first branch, the superior thyroid, thus cutting off the lingual, ascending pharyngeal, and ascending palatine arteries, all of which supply the new growth. The removal of the tumor may be done at the same sitting or may be postponed for a week or two, when the neck wounds will have healed. The supposed danger of spreading the new growth, when the lymph nodes, the normal barriers, have been removed, appears to be theoretical rather than actual, for after ligation of the external carotid one may usually observe a slight shrinkage of the new growth; its vital energy has temporarily abated.

Apparently hopeless cases sometimes turn out to be operable after good access is procured by proper exposure, a requirement which is met by bisection of the lower jaw, either median or lateral. The lateral bisection opens the oral cavity in closer proximity to the new growth, but the central cut through the jaw also gives very satisfactory access and has the advantage of being less likely to impair the function of deglutition, a rather important factor in guarding against aspiration pneumonia. Furthermore, if a lateral division is made, the muscles of mastication will tend to draw the shorter arm of the jaw up higher than the longer one which, in addition, is held down by the geniohyoid muscles. This tendency to displacement by the lateral division is met by making the cut through the jaw in an oblique direction, from above downward and forward, so that, when the short arm is drawn up, it will force the long arm to move with it. The speaker preferred the median incision and had practiced it regularly, with but a few exceptions.

The simplest form of anæsthesia is the colonic, but, to render it reasonably safe, the patient should never be deeply anæsthetized, as the preservation of the reflexes at the larynx helps to serve as a safeguard against aspiration, which is a frequent cause of pneumonia. He gave four ounces of ether, no paraldehyde and no chloretone, preferring to support an insufficient narcosis by the occasional inhalation of a little chloroform, that drug being selected, if the cautery is to be used.

The procedure is as follows: The patient is placed in a position with the head hanging from the edge of the table, so that blood and secretions may run away from the larynx into the nasopharynx whence they are removed by a suction apparatus. The lip is divided in the centre and the incision carried down in the median line to the middle of the hyoid bone. At the chin the incision goes down to the bone, in the submental space only through the skin and superficial fascia. The vessels are secured. The soft parts covering the chin are held apart but are left attached to the bone. Before the jaw is divided, one or two pairs of drill holes are made, to serve for subsequent rewiring of the man-

dible. The intact mandible affords a better support for the drill and better opportunity to estimate the correct alignment of the drill holes. The site of these drill holes is always obscured later on by the overlying soft tissues, therefore it may be of advantage to mark the site in some way, for instance by the insertion of a piece of sterilized toothpick which, after the bone has been sawed through, may be replaced by a thread. If the thread is inserted so as to form a loop on the inner side, it will serve subsequently for drawing the wire through the drill hole. The mandible may be divided either exactly in the middle or between the first and second incisors on the affected side, in which case the spine of the mandible with the insertion of the geniohyoglossus and geniohyoid muscles remains intact. The jaw is divided with a Gigli saw. A suture through the tongue serves to draw it in any given direction. The two halves of the mandible are held apart by retractors. The mylohyoid and digastric muscles on the affected side are divided near their insertion at the jaw. While the tongue is being drawn toward the healthy side, the mucous membrane covering the floor of the mouth is divided well back to the vicinity of the lesion. Now retraction of the jaw affords perfect access. For excision of the new growth the knife may be used or the cautery. He preferred the cautery, as the ensuing eschar insures against accidental implantation of tumor tissue into the wound. If the base of the tongue is involved, the resection begins at that organ, because, after the healthy part of the tongue has been released from the affected, infiltrated portion, it can be drawn out of the way much better than while it was still attached. The rest of the affected part is then circumscribed by the cautery at a distance of at least one centimetre from the new growth. and the entire mass is removed in one piece. Although the external carotid artery has been tied, it is necessary to watch for vessels, and these are secured promptly. The operation being completed the jaw is wired, and the soft parts are sutured.

The question of drainage has to be decided in each individual case. If the lateral approach was selected, the suggestion of establishing a pharyngeal fistula by attaching the pharyngeal mucous membrane to the skin deserves consideration, for it offers the best safeguard against aspiration of secretions. Later on, the fistula either closes spontaneously or is closed by the surgeon. In cases attacked by the median approach the drains are placed at the posterior end of the submental wound, provided one drains at all. He scarcely ever drained in these cases but depended upon natural drainage either forward through the open mouth or downward through the pharynx and œsophagus. The patient is carefully watched after the operation till he is well out of the anæsthesia, and he is placed with his mouth directed more or less downward. To guard against closure of the glottis due to sinking back of the tongue, the suture is allowed to remain in the tongue till the patient is well awake, so that the attendant may have a ready means to draw it forward, if necessary. The function of deglutition is trained as early as possible, water being given. The patient is also kept busy rinsing his mouth with permanganate of potash.

When the wounds have healed, the resulting defect appears surprisingly

small, as may be seen in the two cases presented. In both cases the lesion was prickle-cell epithelioma; in both cases it involved the entire tonsil and portions of the tongue, soft palate, pillars of the fauces, and mucous membrane of the lower jaw. In the more recent case the involvement of the palate and of the pharynx was quite extensive. In the older case the lymph nodes were carcinomatous; in the more recent case they were merely hyperplastic. In the older case, about one and one-half years after the operation, there developed a lymph-node metastasis on the opposite side, beneath the parotid gland. A packet of superficial lymph nodes was removed and, somewhat later, a deeper packet which had probably been overlooked at the previous operation. Although both of these were carcinomatous, no metastasis has occurred since then. At the site of bisection of the bone there occurs a superficial necrosis, in which case the spicules of bone usually find their way out. In the older case presented the necrosis was rather more extensive than usual, and the scar at the chin is depressed where the sequestrum was shed; moreover, the union between the two halves is ligamentous, not bony, but, nevertheless, firm and immovable. In the recent case the union appears to be bony. In some cases the wire has to be removed, if a fistula leading down to it persists; in other cases it becomes imbedded without any reaction.

MYCOTIC CYSTS OF THE LIVER

Dr. Allen O. Whipple, of New York, presented a girl, eleven years of age, who was admitted to the Presbyterian Hospital with an enlarged abdomen. The child complained of no symptoms, but one year ago it was noted by her mother that her upper abdomen was increasing in size. This gradually increased and for past three months there had been noted a very distinct bulge in the upper abdomen. She had gained eleven pounds in the past year. There has been no definite pain but in the past three months there has been a distinct feeling of fulness in the upper abdomen after eating which has made her hesitate to eat full-sized meals. There has been no tenderness, no nausea or vomiting. There has been no urticaria or jaundice.

She was a rather thin, sallow, anamic girl of eleven, shy but intelligent. There is some pallor of mucous membranes. The striking finding is the visible enlargement of the upper abdomen as shown by a marked bulge with three elevations or bosses in the epigastrium and right and left upper quadrants. There is no peristaltic wave, nor visible pulsation. On palpation no tenderness is elicited, but there is a definite fluid wave made out between the bosses in the right and left upper quadrants. These appear to be in an enlarged liver, the lower border of which comes well below the umbilicus on the right and to the level of the umbilicus on the left. The liver moves on respiration. On tapping the boss in the epigastrium a distinct hydatid thrill is noted by several observers. No fluid wave or shifting dulness is made out. Spine and extremities are normal. No edema or urticaria is noted. Laboratory findings normal.

Flat abdominal film does not show either of the kidney outlines distinctly (due to enlarged liver). No shadows are present suggesting calcified nodes or calcified cyst wall.

October 4, 1928, she was operated upon with a diagnosis of hydatid cyst of the liver. When the peritoneum was opened, situated in the right and left lobes of the liver was a large cystic mass, the pearly white-colored wall of which could be seen through a thin layer of liver tissue. On incising through this the wall of a cyst was easily defined and was separated from the liver tissue

easily. After plunging the trochar into the cyst some 1500 to 1800 cubic centimetres of a brownish-yellow, grumous fluid, of a thick purée consistency,

was aspirated. But this contained no hooklets or daughter cysts.

With the collapse of the contents by aspiration, using the technic of Alessandri, of Rome, it was possible to separate the first half of the cyst wall from the outlying liver tissue as easily as one does in hydatid cyst removal. But then the cyst wall appeared to merge more intimately into liver tissue so that soon it became impossible to draw out more of the cyst wall without much

bleeding and tearing of liver tissue.

The cyst appeared to have two main compartments, one in the right, one in the left lobe, the former being the larger. On looking into the cyst cavity its anterior half, corresponding to the part that easily separated from living tissue, was smooth and of a pearly-white color, the cyst wall in this part measuring one to 0.5 centimetre in thickness. The deeper portion of the cyst appeared to have a lining of shaggy, broken-down liver tissue. There was no bleeding or flow of bile from the inside of the cyst cavity. The portion which merged with liver parenchyma bled easily, however, when attempts were made to separate it from the liver tissue. There was no evidence of ascites or portal obstruction. The gall-bladder and bile passages appeared normal. No evidence of other cysts in the abdomen was made out. The margins of the cyst wall were sutured to the abdominal wall and weak iodoform packing loosely applied to the subcutaneous tissue around the marsupialized cyst wall.

Three weeks later the patient was subjected to cystoscopy of the cyst cavity. It was possible by first irrigating the cavity and then filling it with normal saline to insert the cystoscope and get a very good view of the interior arrange-

ment of the cavity.

It was made up of several pockets opening into the main cavity which had collapsed to a great extent. These side pockets had the appearance of diverticula as one sees them in the bladder. But the lining of the main cavity and its side pockets was made up of a variable amount of shaggy, fragmented pieces of necrotic liver tissue waving in the fluid very much as seaweed on the floor of the sea. No evidence of bleeding or bile-stained fluid was made out in the examination.

Pathological Report of October 8, 1928. Gross.—Specimen is a piece of tissue removed from the wall of a liver cyst. It is roughly triangular in shape and measures two centimetres along its base and two centimetres along the other two sides. The wall is four millimetres in thickness. One surface is dark brown in color and covered by fibrous tabs. The reverse surface is gray in color and likewise covered by tiny fibrous shreds. On section, the tissue cuts with some difficulty and seems to be composed of dense, grayish, fibrous tissue.

Microscopic.—A relatively anuclear fibrous connective tissue forms the major portion of the cyst wall. Many small lymphocytes are found in the interstices between the fibres. Covering one surface is a dense network of fibrin and enmeshed within it may be seen numerous polymorphonuclear leucocytes and a few small lymphocytes. Within the wall proper, a small amount of hemosiderin is found.

Diagnosis.—Cyst of liver (infected).

The studies of the cyst fluid proved most interesting and the study of the mycology in this case, together with that of a cyst of the pancreas in a second patient and that of a very remarkable cystic condition of the pleura in a third patient, with animal experiments now under way, will be reported in full at a later date by Doctor O'Connor.

At present it may be stated that the cyst fluids have all been sterile to ordinary culture media for bacteria. They contained a vegetable or yeast-like

MYCOTIC CYSTS OF THE LIVER

organism, having some of the characteristics of the saccharomyces. But they appear to be a distinctive variety hitherto undescribed as a pathogen in man.

The patient continued to pour out large amounts of the glairy colorless fluid for some six weeks, when the sinus had narrowed down to a track. This on injection with sodium iodide was reported as follows:

X-ray Examination of the Abdomen, October 30, 1928.—Stereoscopic films of the abdomen with the patient supine, after the injection of sodium iodide into a sinus, shows the opaque material extending upward and to the right, apparently to a point beneath the anterior surface of the liver, relatively near the lateral abdominal wall. It is extremely difficult to tell whether the material goes into the liver or not. Assuming that the anterior margin of the liver is lower than the posterior it apparently does enter the liver itself. The margins of the shadow of the opaque material are very irregular. It seems to send projections off from the main channel upward and to the left. It is much wider about half-way from the sinus opening to the distal end of the channel than elsewhere. The channel seems to lie anterior to the hepatic flexure. A lateral view seems to show the channel extending straight backward, and its tip overlies the shadow of the liver. I still am not absolutely sure whether the opening enters the liver itself.

Because of the effect of iodides on blastomyces and actinomyces she was given large doses of potassium iodide and the cyst cavity was irrigated with weak iodine solution. Smears from the exudate showed that the vegetable organisms had largely disappeared, although they could be grown on Sabouraud's culture medium even when the cyst had decreased to a sinus tract. The child was discharged afebrile on the fifty-eighth day with a small sinus track.

Nine days later she returned complaining of pain and tenderness in her right upper quadrant and fever of two days' duration. She had felt well for a week after leaving the hospital. On admission her temperature was 104, pulse 140, and respirations 22. The child was evidently sick and in pain. She showed no jaundice or rash. Examination was negative save for the abdomen which was distended. The patient tends to tip body to the right as she lies in bed, and this gives a prominent bulge over the entire left side of the abdomen. In the right upper quadrant is a granulating wound three by six centimetres with a narrow sinus track about three millimetres in diameter, and which extends down into the liver substance about eight centimetres. A small amount of discharge of a cloudy, reddened nature comes from this with a few small, whitish particles that look like fibrin. The abdomen bulges slightly to the right and just above this granulating area, and is markedly tender just lateral to it. Liver percusses down to level of umbilicus. Marked tympany over left and lower abdomen. Liver felt at level of umbilicus. No other organs or masses felt. No herniæ.

Laboratory Findings.—Red blood cells 3,600,000, hæmoglobin 60 per cent., white blood cells 14,000, polymorphonuclear leucocytes 72, lymphocytes 28. Blood culture—no growth.

She was observed for four days with elevated temperature and because of bulging right flank and right upper quadrant she was reoperated upon December 15, 1928. The findings proved most interesting in the light of the previous findings and the pathology of these peculiar mycotic lesions.

Situated in the anterior aspect of the enlarged right lobe of the liver, but below and to the outer side of the site of the previously evacuated cyst, was found a small cyst about one centimetre below the liver surface and about three centimetres in diameter. This cavity contained several cubic centimetres of a yellowish, thick fluid resembling pus. Situated beneath and posterior to this cavity was a second much larger cavity containing about 800 cubic centimetres of thin, turbid fluid.

11

ld

Both these cavities had a distinct membrane or cyst-like wall which had much the same characteristics of the thick wall encountered at the first operation. So firm and thick were these walls that they offered a very real resistance to the insertion of the exploring needle. No bleeding and no bile was encountered in either one of these cavities. No free cysts or scolices were

found in either cavity.

Procedure.—An eight-centimetre incision was made one centimetre below and parallel to the right costal margin down through the peritoneum and to the free liver surface. The peritoneum was walled off by iodoform gauze, leaving a free surface of liver. This was punctured in an upward and backward direction for a distance of one centimetre when the pus-like fluid was evacuated. This cavity was then opened, a portion of wall removed for biopsy, and the exploring needle was then passed through the bed of this first cavity into the second larger one with the evacuation of the clear fluid mentioned. A large rubber tube was then inserted into the deeper larger cavity and this with the packing were brought out through the wound. The tube was sutured into the skin edges. Dry dressing.

The pathological examination of the cyst walls and the contents showed the

same findings as at the first operation.

The large cavity decreased in size again, narrowing down to a track, but on her twenty-fourth day, after some temperature, she discharged a large amount of the same glairy fluid. After injection of this tract with sodium iodide X-ray examination of abdomen was reported as follows:

X-ray Examination of Abdomen, February 1, 1929.—Films of the abdomen taken in the lateral position, and stereoscopic films in the anteroposterior position, shows the opaque solution to be situated in the medial and anterior aspect of the liver region. A portion of the opaque solution extends upward through a narrow channel into the anterior central portion of the liver. The outer cavity measures about eight centimetres across, and five centimetres in the anteroposterior plane. Under the fluoroscope the solution injected into the lower sinus was seen to fill another cavity, which was situated somewhat below and posterior to this upper larger one. No communication was found between them.

The child is still draining and the prognosis is problematical.

This case is reported to call attention to the cysts occurring in the solid organs and in the serous cavities that on ordinary culture prove sterile. We feel sure that many of these so-called sterile cysts or abscesses are of mycotic origin and that if the contents are carefully examined microscopically mycotic bodies will be found. A full report on this case and the cases with pancreatic and thoracic cysts from the standpoint of their mycology, animal inoculations and clinical features will appear at a later date.

DR. WALTER M. BRICKNER, of New York, said that at the last meeting of the New York Surgical Society he had presented a woman with mycotic ulcers of the leg and mycotic pyarthrosis of the knee which later recovered promptly after irrigation of the joint.

Dr. John Speese, of Philadelphia, said that Doctor Whipple's case called attention to the necessity for more careful and thorough cultural and microscopic studies in cases in which the focus of infection is difficult to demonstrate. Every surgeon has seen abscesses and other conditions in which some type of infection has seemed almost a certainty, and the laboratory report is returned as negative. This suggests, in some instances, that types of infection similar to the one reported by Doctor Whipple may have existed. While the echino-

SAFETY IN RESECTION OF THE STOMACH

coccus produces the most common form of parasitic cyst found in the liver in the human, other intestinal parasites may gain access to the liver and form cysts. In some of these cases, degeneration of the parasite had made it difficult to ascertain its exact nature, but this is not the case in the echinococcic cysts. The age of Doctor Whipple's patient suggests the possibility of congenital cystic disease which may involve the liver, pancreas or kidneys. In the cystic diathesis, however, the cysts are multiple and comparatively small in size.

Doctor Whipple, in closing the discussion, said that because of the effect of iodine on mycoses this child was put on heavy doses of potassium iodide and the cyst had been irrigated with a weak iodide solution. In some cultures subsequently the organisms had disappeared, but later on they reappeared which makes the prognosis problematical.

FACTORS OF SAFETY IN RESECTION OF THE STOMACH FOR GASTRODUODENAL ULCERS

Dr. RICHARD LEWISOHN read a paper with the above title, for which see page 69.

DR. GEORGE P. MULLER, of Philadelphia, noted that Doctor Lewisohn did not lay stress upon gastrectomy as a treatment for duodenal ulcer. Doctor Muller feels that in view of the fact that at least 80 per cent. of patients with gastro-enterostomy for duodenal ulcer enjoy good health and freedom from symptoms, the major operation should not be attempted routinely unless the surgeons are in a position to do a great many of these operations and thus operate with a mortality as low as that of gastro-enterostomy. Except for the complete cutting off of food traffic through the pylorus, the operation does not seem to have a good physiological basis.

The speaker prefers to subject a small percentage of patients to second operation rather than to perform gastrectomies upon the entire group. In several patients who have had recurrence of hæmorrhage from duodenal ulcer after gastro-enterostomy, he has had excellent results by completing a Billroth No. 2 operation at a second stage.

On the other hand, this figure agrees with Doctor Lewisohn's, in showing that pyloric ulcers and those involving the lesser curvature and antrum are proper subjects for primary resection. As a matter of fact, the speaker believes that all cases of gastric ulcer should be subjected to radical excision because no one clinically, röntgenly, or at operation can definitely exclude cancer in the case supposedly suffering from ulcer.

The speaker finds the greatest difficulty in attempting gastrectomy in cases of ulcer high up on the posterior curvature and frequently he must be satisfied with an excision, followed by a gastro-enterostomy.

All of these operations are dependent upon attention to the factors of safety for a low mortality. In the case of duodenal ulcer a correct diagnosis is a most essential factor. In the case of ulcer in the region of the pylorus, recognition of retention or obstruction is essential because such patients should be properly treated for a number of days before operation in order to lessen the effect of starvation, loss of chlorides and anæmia. Hence, gastric lavage, free use of salt solution with glucose and blood transfusion are essential.

NEW YORK SURGICAL SOCIETY AND PHILADELPHIA ACADEMY

RECONSTRUCTION OF COMMON DUCT. NEW PROCEDURE

Dr. Eugene H. Pool, of New York, said that the numerous operations which have been attempted for the correction of a stenosed common duct are

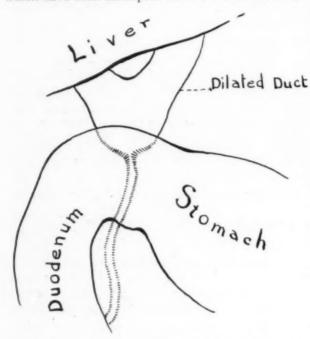


Fig. 1.—Diagrammatic representation of dilated duct or bile reservoir above obstruction of common duct and its relation to the duodenum.

Dilated Duct failures. It is unnecessary to review these procedures. The method which is to be described is the result of an attempt to find a simple and safe means of reëstablishing a stenosed common duct, in cases where the gall-bladder has been removed.

The anatomical conditions in such cases are as follows:

First.—The common and hepatic ducts above the obstruction are enormously dilated forming a real bile reservoir.

Second.—The duodenum is usually high, close to the liver and close to the dilated duct above the stricture.

Third.—These structures are buried and united in a mass of solid adhesions.

The usual operations demand extensive dissection of the adhesions so as to expose the bile reservoir and displace the duodenum. After this prolonged dissection an anastomosis is made, the parts being brought together in much the same position in which they had been, and, to protect against leakage, an effort is made to reproduce the protective adhesions by apposition of omentum, etc.

His suggestion is to leave the structures in proximity and to leave the protective adhesions, to open the duodenum and do an internal choledocho-enterostomy. Such an operation should be simple, and short, with little danger of leakage. This is intended as a suggestion only; the technical details have not been worked out and perfected. Perhaps it will be impossible to do so. Yet in the one case in which the procedure has been attempted the results are promising. He therefore presented it for discussion.

A colored housewife, thirty-two years of age, entered the New York Hospital January 9, 1928, for relief of jaundice. Since 1911 she had been subject

RECONSTRUCTION OF COMMON DUCT

to frequent attacks of epigastric pain associated with jaundice. In 1927 the gall-bladder had been removed. After operation the pain and jaundice were relieved for five weeks. A swelling then appeared near the scar and jaundice recurred. The swelling burst, and bile was discharged, causing disappearance of the jaundice. Then the sinus closed and jaundice once more returned.

In October, 1927, the patient was operated upon for these symptoms. The operator reports that he found a severed common bile duct which he drained.

A biliary sinus developed and the jaundice persisted. With this history the patient was admitted to the New York Hospital, lanuary, 1928. She was a thin, colored woman, looking chronically sick and deeply jaundiced. The abdomen showed a sinus in the right upper quadrant from which bile was discharging. The icterus index was 39.0. Blood Wassermann negative. The urine showed much bile. Stools were light in color.

January 16, 1928, choledocho-enterostomy was performed. Anæsthesia—Ethylene-ether. Incision.—Right epigastric mesial to the former scar. Duodenum identified but not dissected free. One and one-quarter inches from pylorus a transverse incision was



Fig. 2.—Aspirating needle introduced through duodenal wall into bile reservoir.

made in duodenum. A small aspirating needle was introduced upward through upper wall of duodenum, and blood was obtained. The needle was then passed upward and slightly outward and bile was obtained. (Fig. 2.) Methylene blue was injected and a clamp was passed along the needle and the orifice stretched, methylene blue coming out through the opening into the duodenum. Duodenal incision closed from above downward with three rows of chromic. Omentum sutured over this. Wound closed in layers without drainage.

The post-operative course was uneventful. The wound healed by primary union and the sinus remained closed.

She felt well for six months following discharge. Then afternoon temperature began, accompanied by increasing jaundice and occasional clay-colored stools; also loss of weight and gastric distress.

In spite of the ultimate failure of this operation Doctor Pool felt somewhat encouraged. In the first place, the fistula closed, and although there was at first no pressure of bile from above on account of the fistula, the stoma functioned for some months. Second, the operation was too conservative. As in any new procedure one is apt to feel one's way uncertainly and as a result the new opening was not made sufficiently large.

NEW YORK SURGICAL SOCIETY AND PHILADELPHIA ACADEMY

She was readmitted to the New York Hospital November 13, 1928, deeply jaundiced. The urine contained bile, while the stool showed only a trace. Icterus index was 62.0.

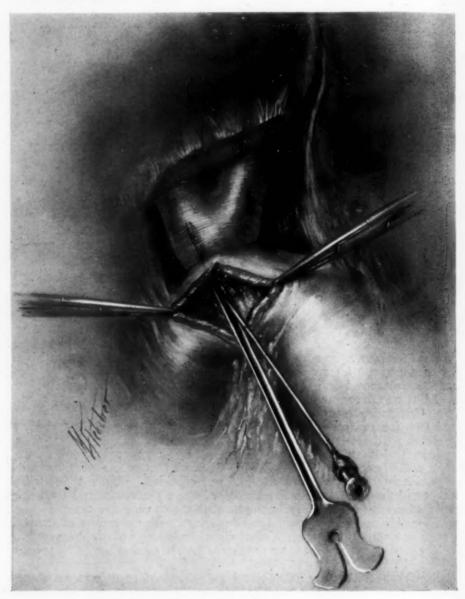


Fig. 3.—Grooved director passed along needle.

Operation November 26, 1928. Anæsthesia—Ethylene-ether. *Incision.*—Right upper rectus excising the old scar. The duodenum was found to be closely adherent to the inferior surface of the liver. The adhesions were not detached. A vertical incision was made in the anterior aspect of the first portion of the duodenum. An aspirating needle was inserted through the superior

RECONSTRUCTION OF COMMON DUCT

wall of the duodenum toward the liver. At first blood only was obtained. The needle was withdrawn and directed upward and slightly outward. This time pale greenish-colored fluid was obtained. Leaving the needle in place a specially prepared grooved director was introduced along the aspirating needle

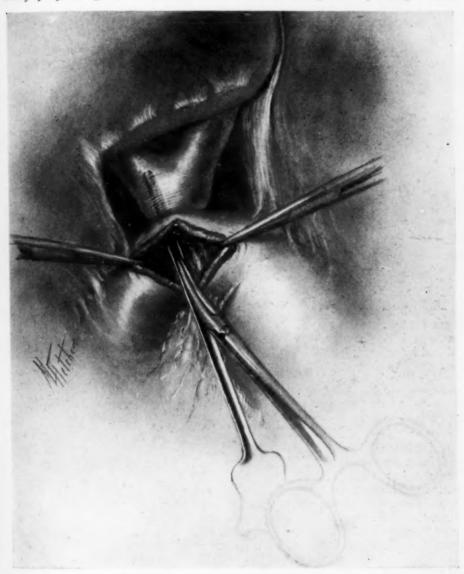


Fig. 4.—Artery clamp passed along grooved director.

through the superior wall of the duodenum into the bile reservoir. (Fig. 3.) There was a gush of bile and some purulent fluid. An artery clamp was passed along the grooved director and the orifice stretched. (Fig. 4.) A No. 26 French catheter four centimetres in length was introduced through the opening in the duodenum into the bile reservoir. (Fig. 5.) This was fixed with one catgut suture. The opening in the duodenum was then carefully repaired with two layers of catgut. The wound was closed. (Fig. 6.)

NEW YORK SURGICAL SOCIETY AND PHILADELPHIA ACADEMY



Fig. 5.-Tube in place.

The post-operative course was smooth. The wound healed by primary union. The jaundice disappeared and by the time of discharge the urine was free of bile, the stools were normal in color and the icterus index had fallen to 16.0. The tube was passed per rectum on the eighth day. The general condition of the patient was rendered quite normal. She was discharged on the sixteenth day. At present, about three months after operation, her condition is normal, weight has increased twenty pounds, icterus index 11.

The technical feature

of the operation not yet established is the best way to prevent the anastomosis from contracting. It may be that this can be accomplished by sutures; but the reporter now feels that in another case he would introduce a tube somewhat constricted at the centre. The enlarged ends would prevent it from working back into the bile reservoir and from passing quickly into the duodenum. Of course if it did not pass into the intestine after a proper interval it might be necessary to remove it by operation. Danger from passing the small needle into the portal vein seems negligible. Apparently this was done at each operation without harm. Moreover, with the knowledge that the needle must be passed somewhat laterally and not directly upward,



Fig. 6.-Duodenal incision sutured.

this embarrassment can probably be avoided in a subsequent case.

Dr. EDWARD J. KLOPP, of Philadelphia, said that on one occasion he was obliged to anastomose the common hepatic duct with the duodenum following an operation early in 1925, when the gall-bladder was removed and the operating surgeon injured the common duct causing occlusion of the duct. Two months later he was reoperated and again occlusion of the duct followed. Late in 1925 the man came under Doctor Klopp's observation. He was then markedly jaundiced with enormous swelling in the upper abdomen. An interne made a nick in the skin and evacuated bile. After several weeks an attempt was made to relieve the constriction of the duct. A T-tube was inserted in the common duct extending into the duodenum. The man made a nice recovery and remained free from jaundice for three months, and then becoming jaundiced again returned for relief. At the operation the distal portion of the common duct was found to be replaced by scar tissue. It was impossible to anastomose the duodenum with the proximal portion of the common duct. Fortunately the common duct opening into the duodenum was found and a No. 10 catheter passed through it into the duodenum. Having failed previously to permanently establish the common duct it was decided to implant a larger catheter, whereupon a No. 24 catheter was selected. It was impossible to pass it through the duct opening even after dilatation with a duct forceps. The duodenum was opened following the suggestion of Duval and Richard, the papilla dilated with duct-stone forceps. Even though they were unable to insert a No. 24 catheter the No. 10 was passed. The eye end of the No. 24 catheter was sutured in the funnel end of the No. 10. In that manner the larger catheter was passed without difficulty. The funnel end of the large catheter was placed in the proximal portion of the common duct; approximately four inches of the eye end of the catheter was cut off, and the catheter passed on down into the duodenum and the incision was closed. Omental structure in the vicinity of the duct was sutured over the reconstructed duct. The abdominal wound was closed with a Penrose drain. There was leakage of bile for the first five days following the operation, when it suddenly ceased and the wound promptly closed.

The man is now in fairly good health, working every day. A recent X-ray shows the tube approximately as it was placed in May, 1925. About a year ago he presented this case at the Philadelphia Academy of Surgery. He suggested then that it might be well to consider removal of the tube. Doctor Deaver remarked that he had a patient in whom he had used a short tube in an obstruction of the common duct and allowed it to remain five years when it was passed spontaneously. It is astonishing how long a foreign body can remain in a patient with little discomfort.

Dr. Charles F. Nassau, of Philadelphia, said that about seven years ago a patient came under his care who had a gall-bladder removed. The patient had jaundice and fever when he came to the speaker. After an operation which was extremely difficult and prolonged both ends of the common duct were exposed. The scar tissue was removed and the remaining portion of the duct was found to be normal. A piece of catheter was inserted to bridge the

NEW YORK SURGICAL SOCIETY AND PHILADELPHIA ACADEMY

gap between the ends of the duct which were about one inch apart. An omental graft was placed over the tube and the patient had no difficulty or recurrence of jaundice for about six years, at which time he died of carcinoma of the stomach. The operation was never reported but there is in existence an X-ray taken about three years after the operation which showed the tube *in situ*.

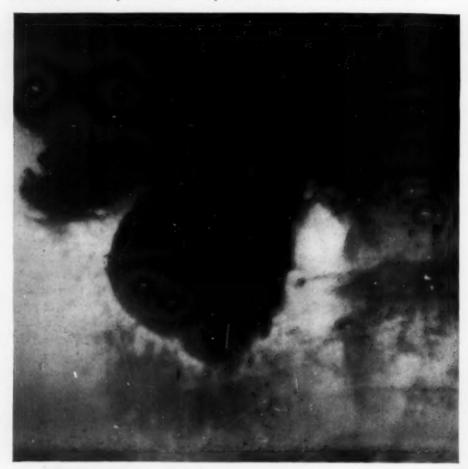


Fig. 7 .- Diverticulum of duodenum.

DIVERTICULUM OF DUODENUM

Dr. Eugene H. Pool presented a woman, sixty-two years of age, who was admitted to the New York Hospital, October 23, 1928, because of repeated attacks of vomiting which had occurred for two and one-half years. First attack was in May, 1926. At that time she vomited green mucous material, no blood. Vomiting continued for one week. She had another attack of vomiting four months later lasting for several days and another attack the following month which lasted only one day.

There followed a period during which she was well. She then had three similar attacks in November and December, 1927, and one in June, 1928. Each attack of vomiting was preceded by belching gas and epigastric distress. Following the attacks she lost her appetite and felt exhausted for several weeks,

DIVERTICULUM OF DUODENUM

Dr. Walter Niles, who saw her first in June, 1928, reports that June 14, 1928, her urine contained a large amount of sugar, as well as a marked reaction for acetone. There was no diacetic acid; there was a faint trace of albumin and numerous hyaline and granular casts. On June 15 her blood sugar was 186 milligrams per 100 cubic centimetres of blood; June 16 her blood chemistry was as follows:

Urea Nitrogen 1	8.	mgms.	per	100	c.c.	of	blood
Non-protein Nitrogen 3		mgms.	per	100	c.c.	of	blood
Uric Acid	4.4	mgms.	per	100	c.c.	of	blood
Sugar		mgms					
Chlorides							
Creatinin	1.879	mgms.	per	100	c.c.	of	blood

June 17 and succeeding days there was no glycosuria.

Her next attack began on September 27, 1928. There was again a large amount of sugar in the urine, with considerable actions and diacetic acid.

The sugar persisted for four days, although the acid bodies disappeared in two days. Her blood sugar on September 28, 1928, was 198.

Fæcal examinations made during the attacks showed large amounts of mucus and many undigested starch cells. There were no other evidences of pancreatic insufficiency. Lost twenty-five pounded during past two and one-half years.

February 13, the abdomen was opened. Adhasions were freed between the gall-bladder and the duodenum. The colon was displaced downward and the duodenum mobilized. The duodenum and head of pancreas



Fig. 8 .- Diverticulum of duodenum showing fluid level.

were then lifted mesially like a trapdoor. The diverticulum was then identified closely opposed to the posterior aspect of the head of the pancreas. It was collapsed but measured about two inches in diameter. It was, of course, retroperitoneal. Four or five large thin-walled veins lay on its surface. These were ligated and divided. The sac was then readily dissected free. Its wall was very thin; its neck two centimetres in diameter was situated at the lower part of the mesial aspect of the descending duodenum. The diverticulum was excised a short distance from the duodenum. The orifice was repaired transversely with three rows of chromic gut. Extreme care and thoroughness were necessary on account of the inaccessibility and the retroperitoneal position. When the repair was completed it was felt that the lumen of the duodenum was so

much encroached upon that obstruction might occur. Therefore a posterior gastrojejunostomy was done. The wound was closed without drainage.

Post-operative course entirely smooth. Patient discharged twenty-one days after operation. She has had no further complaints, eats everything, general health good. No sugar has been noted in the urine. February 3, 1929, blood sugar 125 milligrams per 100 cubic centimetres of blood.

DOCTOR POOL thought this case to be of interest, first, on account of the unusual situation of a large diverticulum; it lay posterior to the head of the



Fig. 9 .- Diverticulum of duodenum, excised.

pancreas. Second, because of the peculiar symptoms, notable periodic attacks of vomiting with hyperglycæmia and glycosuria presumably due to pressure by the dilated diverticulum upon the pancreas or its duct. Third, these disturbances were cured by operation.

Dr. John H. Gibbon, of Philadelphia, said that there were three types of diverticulum of the œsophagus.

First, that due to perforating ulcer which is quite common. Second, that due to a probable congenital defect in the musculature which results in a herniation of the mucous membrane, and resembles very closely, he thought, in development and pathology, a diverticulum of the œsophagus. To this class Doctor Pool's case belongs. Of this class Doctor Gibbon has seen no case.

The third type resembles the Meckel's diverticulum found usually in other parts of the small intestine. Slides were then shown illustrating an unusual case of the latter type which was operated upon at a meeting of the Clinical Society of Surgery at the Pennsylvania Hospital last fall. The diverticulum in this case was very long, and when filled with barium, changed its shape, indicating a definite musculature. On opening the abdomen the diverticulum, about the size and shape of a thumb, came off from the anterior wall of the duodenum, and the communication between the diverticulum and the bowel corresponded to the width of the former. The extremity of the diverticulum was free, which accounted for the different positions in which it was seen in the X-ray plates. Its removal, of course, was a simple matter. Doctor Pool's case was a very much more serious one, and one in which successful removal was very much more difficult.

Dr. Frank S. Mathews referred to a case, somewhat like Doctor Pool's, in which, in advance of operation, he thought he was dealing with a case of common-duct stone. The X-ray showed a shadow to the left of the duodenum which was interpreted as indicating that bismuth entered the common duct. At operation the common duct was drained, but there were no stones. At

SPREAD OF BACTERIA

autopsy the patient was found to have multiple abscesses in the pancreas. A diverticulum of the duodenum, apparently congenital, lay in contact with the pancreas and opening beside the common duct. It was thought that this diverticulum might be related etiologically to the suppurative pancreatitis.

THE SPREAD OF BACTERIA FROM THE GALL-BLADDER TO THE LIVER

Dr. Walton Martin read a paper with the above title, for which see page 47.

Dr. I. S. Ravdin, of Philadelphia, said that he was in Edinburgh at the time that Dr. A. L. Wilkie did his work. There were several very interesting factors in connection with it. In the first place, in the majority of instances in which the bile was cultured, it was found to be sterile. When a culture was made of the wall of the gall-bladder with the mucosa intact, it was practically always sterile, but when the mucosa was removed in a large number of instances Doctor Wilkie was able to obtain a positive culture which coincided with the culture he obtained from the cystic lymph gland. The organism which he recovered he believed to be similar to the Rosenau streptococcus which has a "specific affinity" for the gall-bladder. Whether the gall-bladder is primarily infected, or is infected secondary to hepatitis is questionable. It is definitely known that hepatitis may result from cholecystitis and that the reverse process may likewise take place. Whether the mechanism of the infection is lymphatic in its origin is questionable. It is exceedingly difficult to demonstrate a continuation of the gall-bladder lymphatics into the liver substance.

Doctor Ravdin has tried this by three methods—the use of colloids, by air injections of the lymphatics, and by the use of carbon particles. Although the gall-bladder lymphatics fill out exceedingly well, and the material enters the glands around the head of the pancreas, one does not find them passing back into the liver. It appeared to him that although there is no doubt of the relationship between hepatitis and cholecystitis, that it has not been shown beyond any doubt that this connection is lymphogenous.

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY

STATED MEETING HELD FEBRUARY 27, 1929

The President, Dr. Frank S. Mathews, in the Chair

THE CURE OF SPONTANEOUS PNEUMOTHORAX

Dr. Howard Lilienthal presented a young man who, at the age of nineteen years, in December, 1927, "caught cold" and on February 15, 1928, while attending a college lecture experienced sudden thoracic pain and great dyspnæa. Pain lasted a few minutes but the dyspnæa and slight cough persisted.

X-ray pictures revealed an extensive right pneumothorax.

Doctor Lilienthal first saw him April 20, 1928, and on testing his vital capacity found it to be only one and one-half litres. Blood pressure was 120/80, his weight about 130 pounds. The X-ray picture revealed complete pneumothorax under considerable tension, for the mediastinum was pushed far toward the left. No treatment was advised in the hope that, as in other cases under his observation, the air might be absorbed. Two or three nights later Doctor Lilienthal was awakened by a telephone call and the report of dangerous dyspnæa and deep cyanosis. The patient lived in Brooklyn and realizing that prompt action was necessary Dr. H. S. Fischer was requested to aspirate at once. This was done with immediate relief and then Doctor Fischer inserted a tube with the aid of a trocar and cannula and applied a flapper valve. The lung, however, did not expand although there was immediate and apparently complete relief. Empyema developed and finally he entered Mt. Sinai Hospital where June 19 Doctor Lilienthal drained the cavity by an intercostal incision and placed a large tube with fingercot valve in the opening. The pus was so thick and there were so many fibrin coagula that Carrel-Dakin treatment was employed. Under the flapper valve suction the lung expanded and became adherent everywhere to the chest wall resulting in a final complete cure. The speaker had not previously heard of the deliberate production of an empyema in cases of this kind, but was convinced that the effect of the subsequent adhesive pleuritis is curative in cases of pneumothorax. At any rate it promises freedom from dangerous recurrence because the adhesions will prevent extreme deviation of the mediastinum.

He would not regard as spontaneous a pneumothorax from a punctured lung due to a fractured rib. Spontaneous pneumothorax in the sense he wished to convey did not include the condition occurring when a tuberculous cavity breaks into the chest. This is tuberculous pyopneumothorax. The cases he spoke of are those which are sometimes seen in children with whooping cough in which tiny congenital blebs break and leak air into the pleural cavity. Of course it would not be wise to give the patient empyema to cure a pneumothorax which will cure itself, but if it won't and there is danger on account of deviation of the mediastinum then, he felt, it is a good thing to have in mind.

EARLY BANTI'S DISEASE-SPLENECTOMY

Dr. Charles Gordon Heyd presented a boy, nine years of age, born in Italy, living the last four years in New York City. The patient entered the

EARLY BANTI'S DISEASE-SPLENECTOMY

New York Post-Graduate Hospital, to the service of Dr. M. C. Pease, January 30, 1929, the complaint being an anæmia and a mass in the abdomen. The parents state that three years ago the patient began to get pale and a small mass was felt in the abdomen. The mass was discovered quite accidentally and aside from the anæmia there were no other symptoms. There has never been any fever associated with the discovery of the mass. Constipation, however, has been a prominent symptom. He was a moderately well-developed, poorly-nourished, anæmic, white-skinned boy, who appeared markedly ill. There was a marked degree of caries, chronically infected tonsils and a dirty condition of the mouth in general. The heart and lungs were not noteworthy. The abdomen appeared distended, tense, with prominent superficial veins. Occupying the entire left side of the abdomen from beneath the costal arch down to the pelvis was a mass that had the general physical characteristics of an enlarged spleen.

X-ray examination showed a large, soft-tissue tumefaction in the left abdomen. The lower pole of the enlarged left kidney was also noted. Wassermann was negative, and the blood examination on admission showed a leucocyte count of 2700, erythrocytes 3,350,000, hæmoglobin 60 per cent., and polynuclear neutrophiles 73, eosinophiles 3, basophiles, transitionals 1; mononuclear leucocytes 8, small lymphocytes 8, large lymphocytes 6. The red cells showed a

uniform tendency to microcytosis.

The bleeding time was five minutes; coagulation time, four to five and a half minutes. No undue fragility of the platelets.

Date	Platelets	Erythrocytes	Hæmoglobin	Leucocytes	Polynuclears	Comment
Jan. 31, 1929	70,350	3,350,000	60	2,700	73	Bleeding time, 5 minutes. Coagulation time 4-5½ minutes. Microcytosis.
Feb. 4, 1929	143,200	3,250,000	62	3,700	73	
Feb. 6, 1929 Feb. 9, 1929	143,200 3,250,000 62 3,700 73 Blood transfusion 400 cubic centimetres whole blood. Splenectomy.					
Feb. 13, 1929	273,600	3,830,000	70	11,000	79	Microcytosis

Urinary examination showed nothing noteworthy.

The clinical diagnosis was made of infantile splenic anæmia, with Gaucher's

disease as a possible second diagnosis.

February 9, 1929, the abdomen was opened through the left upper rectus incision. The spleen was grossly about ten times the normal size and there were many dense adhesions between the spleen and the peritoneum over the left kidney. The spleen was hard, leathery and of a dark blue-gray color. At the superior pole were two large adventitious blood vessels apparently coming from the diaphragm and at the inferior pole an additional aberrant vessel was noted. The gall-bladder was negative to both palpation and observation. In contrast to the spleen the liver appeared as nearly normal as seemed possible. There was no hepatic enlargement. There was no fibrosis and no hepatitis nor adhesions about the liver or gall-bladder. The lymph glands along the under surface of the transverse colon were somewhat pigmented and slightly hyperplastic. The remainder of the abdomen not explored. The operation consisted of a more or less typical splenectomy, during the course of which some venous oozing was encountered in the tail of the pancreas necessitating two mattress sutures through pancreatic tissue. The abdomen was closed in the usual anatomical fashion without drainage.

The pathological report by Doctor Alter showed a spleen weighing 565 grams. The capsule is irregularly thickened and covered with fibrous adhesions, particularly at the

NEW YORK SURGICAL SOCIETY

upper pole. At the hilum larger vessels are seen covered by somewhat cedematous blood clot. On section a uniformly pale parenchyma is seen. It is firm in consistency. Some of the smaller arteries seem to be plugged with black blood clot.

Section of the spleen shows loss of lymphoid tissue. The follicles are small. A striking feature is the extensive hæmorrhage in the trabeculæ. There are also some hæmorrhages in the sinuses and follicles. The sinuses form glandular structures which are lined by rather high endothelial cells. The sinuses are separated by a cellular stroma. The cells are mostly fibroblasts. There are also lymphocytes and polynuclear leucocytes. Old blood pigment is also seen in the sinuses. Fat stains show some fat in the trabecular stroma and endothelial cells. Pathological diagnosis.—Early Banti's Disease. Doctor Alter makes further comment that this type of fibro-adenosis usually occurs in conjunction with a similar liver lesion.

The interesting feature of this case is the fact that for at least three years, the parents knew the child had a mass within the abdomen. During this period the child was carrying on functionally in fairly good condition with always, however, a constant anæmia. It seemed wise to remove this boy's spleen as a means of bringing him back to a more normal individual. The pathological examination of the spleen still leaves some doubt as to whether they were dealing with one of the manifestations of early Banti's disease, or a splenic anæmia of undetermined pathology or finally, a variant of Gaucher's condition.

ŒSOPHAGEAL DIVERTICULUM

Doctor Heyd presented also a man, sixty-one years of age, married; born in Germany and has resided in the city of New York for the past forty years. His present complaint began with difficulty in swallowing, eleven years ago. At first the patient noticed "catching or holding" of his food just below the midpoint of the neck. For the last eighteen months it has become continuously and persistently worse and from time to time the patient has vomited back his food, which seems to come from somewhere in his neck. The inability to swallow has become increasingly more marked. The patient has found that fluids usually go very much better than solid food. He has lost forty pounds in weight.

The man presented a rather extreme degree of emaciation, and a well-defined anæmia. Except for the X-ray findings of the œsophagus with a barium meal there was nothing noteworthy to be observed. On X-ray examination a diverticulum was to be seen arising from the posterior and left lateral aspect of the œsophagus at about the level of the cricoid cartilage. The sac extended downward and backward and somewhat to the left between the posterior wall of the œsophagus and the anterior surface of the cervical vertebræ. When filled with barium the diverticulum extended well below the upper level of the manubrium and in its gross outline was approximately the size

of a Bartlett pear.

The complications that may be expected in operating for diverticulum of the œsophagus are: (1) Aspiration pneumonia, (2) mediastinitis, (3) hæmorrhage, (4) fistula, (5) recurrence. In Stetten's sixty cases the operative mortality was 16.6 per cent. and it is interesting to recall that Zenker and Siemssen in 1877 expressed the hope that œsophageal diverticula might be cured by surgery. Sepsis and pneumonia are the most frequent causes of death. Pneumonia can be to a large extent prevented by using a local anæsthesia, or ethylene gas; by drainage of the diverticulum of its putrid contents through an œsophagoscope; and by avoiding pressure on the diverticulum during the course of the operation whereby the septic material might be forced into the lungs. If œsophageal leakage occurs it will follow along the fascia in front of the ver-

ŒSOPHAGEAL DIVERTICULUM

tebral column and advance into the posterior mediastinum, a complication of great lethal potentialities. Hæmorrhage should be obviated during the course of the operation and afterward by the absence of drainage tubes. Fistula and recurrence are fortunately very rare and to a large extent can be prevented by a precise operative technic and the use of the Levine tube after the excision of the diverticulum.

The patient was operated upon by the two-stage method. The first stage was performed November 17, 1928. The patient was anæsthetized with ethylene gas and an incision made in the left side of the neck, at the level of the hyoid bone, downward along the anterior border of the sternomastoid muscle. The belly of the left omohyoid muscle was divided, the left lobe of the thyroid pulled upward and to the right. The diverticulum was readily recognized and by blunt dissection freed, except at its neck where it joined the resorbagus. The sac was brought out through the upper portion of the incision in almost a direct line laterally from the cricoid cartilage and sutured intact into the skin wound. The skin was closed with Michel clamps. Following the first stage the patient was able to swallow fluids with very little difficulty. At the end of forty-eight hours he was given solid food, which passed readily. He was somewhat disturbed by air passing into the diverticulum and ballooning it out on the neck. On the fourth day a small incision was made in the sac to deflate it by allowing the escape of air. One week later the patient was anæsthetized by ethylene gas and the first incision in the neck was opened up. The sac was readily freed and excised close to the resophagus. The neck of the sac was ligated with No. 2 chromic catgut and inverted into the œsophagus much after the fashion of the inversion of an appendix. Two mattress sutures of No. 2 chromic catgut were also applied after the inversion. The neck wound was closed in anatomical manner without drainage.

A Levine tube was passed through the nose into the stomach and for four days the patient was not allowed to swallow. At the end of the fourth day the Levine tube was removed and the patient allowed soft diet. The skin wound healed readily and with a very minor degree of infection. The patient was discharged from the hospital on the fifteenth day. Since his operation he has been able to eat anything he desires and has gained some twenty-two pounds in weight. At the present time his only complaint is some slight fixation in the neck, in the region of the wound.

Dr. DeWitt Stetten said he saw his first case of œsophageal diverticula twenty years ago. He believed that the condition was not such a very uncommon one as it was thought to be at that time. His paper, published in 1909, was one of the earliest publications on the subject in this country and the following year the Mayo Clinic published six cases. Since that time the Mayo Clinic has reported over thirty cases and of course quite a number of cases have been reported on elsewhere. Doctor Stetten's views on the surgical handling of these cases have undergone some change. At the time of his publication, owing to the high mortality, which was something over 16 per cent., he thought it was advisable to do a preliminary gastrostomy for most of the cases were elderly people who were much undernourished from partial starvation, and those that did not die of infection and mediastinitis died of pneumonia. Today he believes that a gastrostomy is unnecessary and he has also come to the conclusion that

the two-stage operation, as described by Doctor Heyd, is the best and safest procedure. His last case he saw about four years ago. The patient was a very much undernourished man of seventy, on whom he performed the two-stage operation similar to that described by Doctor Heyd. He used local anæsthesia. under which the operation can be done very easily. The patient made an uneventful recovery. The operation is really a relatively simple one, the main point being the identification of the sac. He was glad that Doctor Heyd emphasized the use of the duodenal tube to prevent leakage from the suture line, which can occur even in the two-stage operation. The cesophageal fistula may take a long time to close and may interfere with nutrition of the patient. Doctor Stetten believed that the duodenal tube should be passed in the interval between the first and second stage, because it is unnecessary before the first stage and very difficult to pass as the tube tends to coil up in the diverticulum. After the first stage, when the diverticulum has been drawn away from the œsophagus out into the wound, the tube will pass readily and then active swallowing can be eliminated after the second stage until danger of leakage has passed. If the tube has not been used as a preliminary measure before the second stage and an æsophageal fistula does form, the use of the tube then is the best and most rapid way of causing the fistula to heal.

Dr. Walter A. Sherwood thought that the principal danger in operations for esophageal diverticula to be infection of the mediastinum. A patient consulted him recently who had been strongly urged to submit to an attempt to invert and remove a diverticulum through an esophagoscope. This form of treatment is being quite widely advocated by a group of surgeons specializing in the nose and throat who have had special training in the use of the esophagoscope. In a number of instances in which such a procedure has been attempted the wall of the diverticulum has been perforated and the patient has promptly died of mediastinitis. Doctor Sherwood felt that a note of warning should be sounded against such an obviously dangerous and unsurgical method of dealing with this condition.

Dr. Howard Lilienthal said that before using the cosophagoscope the one who is going to use it should examine the structure of a diverticulum of the cosophagus. As Doctor Heyd has explained, the diverticulum is apt to be extremely thin and very friable and the danger of operation manipulation from within is greater than operation from without. However there is another operative procedure which may be described as the first stage of the operation Doctor Heyd has done and letting it go at that. If the patient is very feeble and one is afraid to do any more, a comfortable existence is possible with this first stage only. Cases have been reported in which the sac was carefully dissected out, brought up into the neck and fastened there leaving the open part of the diverticulum lowest. It is said that cases treated in this way give excellent clinical results and eliminate the risk of mediastinitis.

Dr. Alexis V. Moschcowitz stated that in a recent case he was tempted to do a one-stage operation on what he believed to be a particularly suitable

OSTEOGENETIC SARCOMA OF THE HUMERUS

case of diverticulum of the œsophagus. In this particular case, local anæsthesia was used and the operation was entirely painless.

Doctor Moschcowitz has found that diverticula of the œsophagus have a peculiar yellow color which is sufficient to render their finding very easy. He has also found that the finding of the diverticulum can be materially aided by a competent œsophagoscopist who will introduce a light at the right moment into the esophagus. This diverticulum was very small and Doctor Moschcowitz was able to obtain a very good inversion suture; drainage with a small bit of rubber dam. Within ten days' time, the wound had apparently completely healed, but it broke open and started a leak. The leak was very small but it was sufficient to make the feeding of the patient very difficult and he gradually ran down in spite of the introduction of a duodenal tube for the purpose of feeding. In the course of time, the patient became disgusted with surgery and finally he was discharged with a small leak and sent back to his home town. When the patient reached his home, less than forty-eight hours after his discharge, Doctor Moschcowitz received a telegram that the diverticulum was closed. This has remained closed ever since that time. The patient was seen by Doctor Moschcowitz about two months ago, at which time, he enjoyed the best of health.

Dr. Frank S. Mathews said that when operating on an esophageal diverticulum in a woman, eighty-four years of age, under local anæsthesia, he had found his only difficulty depended in the friability of the sac. On delivering it the sac was torn extensively. Packing was introduced about it and the whole sac sloughed, leaving a fistula which closed spontaneously. Hence there was no second stage to the operation.

Doctor Heyd, in closing, said he had been surprised how easily the operation could be performed. The sac was readily recognized and the moment that it was transfixed to the neck, swallowing could readily take place without back flow into the diverticulum. It would seem that many of these cases of esophageal diverticula are not recognized and that the ordinary surgeon approaches them with fear and trepidation. The two-stage operation eliminates practically all fear of infection of the mediastinum. The Levine tube is a great aid in neck surgery as it permits feeding without the necessity of the patient swallowing.

8

d

18

1-

d

le

OSTEOGENETIC SARCOMA OF THE HUMERUS

Doctor Heyd presented a man, twenty-three years of age, born in New York, who entered the New York Post-Graduate Hospital December 11, 1928, complaining of swelling of the left arm, with constant pain of a dull heavy character of three weeks' duration. About a month ago he noticed that the left arm above the elbow was larger than the right, and there was considerable soreness. Condition remained unchanged for about two weeks. The arm rapidly increased in size and became very tender. Physical examination was unimportant except for the left arm. X-ray of the thorax showed little evidence of pathological change. There was some slight right bronchial thickening but no evidence of parenchymatous infiltration. X-ray of the left arm and shoulder showed a fusiform tumor of osseous origin, occupying the mid-

dle of the left arm. There was periosteal elevation with irregular subperiosteal bone proliferation and slight cortical destruction, suggesting periosteal

osteogenetic sarcoma.

Clinical examination of the left arm showed a fusiform neoplasm occupying the entire left arm from the shoulder to the elbow. On palpation the tumor seemed to be due to bony growth but there was no egg-shell crackling. There was a peculiar red-blue blush over the entire arm and the superficial veins were dilated.

Disarticulation of the shoulder was performed under ethylene anæsthesia December 12, 1928. The first incision ligated the axillary artery in the third portion of its course at the inner border of the coracobrachialis muscle. The larger nerves were pulled downward, injected with one cubic centimetre of absolute alcohol and divided. Following this the disarticulation of the left arm was made at the shoulder. After the ligation of the axillary vein the only vascular anastomosis was between the acromiothoracic artery anastomosing at the anterior circumflex. Bleeding was unusually well controlled and offered no

difficulties. The post-operative course was uneventful.

Examination by Doctor Alter showed a specimen consisting of the left arm which was disarticulated at the shoulder. It was very well developed. The hand and lower forearm showed nothing unusual. The skin showed nothing unusual. About the middle of the humerus there was a spindle-shaped swelling. On section a great deal of blood escaped from irregular cavities. There was a growth, thirteen centimetres in length, which seemed to spring from the periosteum of the humerus. It occupied about the middle third of the arm. The growth extended to within six centimetres of the neck of the humerus. The tumor was very soft, friable and broke down under the least pressure. Throughout the muscle tissue there seemed to be a capsule in some places, but free invasion was also seen. There was a great deal of bony tissue throughout the muscle. The microscopic examination showed a neoplasm which consisted of large polyhydral cells. The nuclei were mostly elongated, vesicular. Mitotic figures were exceedingly numerous. There were numerous giant cells of the endothelial type. There were very rich blood vessels everywhere. There were also large cavernous spaces lined by one layer of cylindrical cells filled with red blood cells. The growth invaded the bundles of striated muscle very extensively. Pathological diagnosis.—Telangiectatic periosteal sarcoma of the humerus. Note.—This is one of the most rapidly growing neoplasms.

The patient made an uneventful recovery and was discharged from the

hospital on the tenth day after operation.

Dr. Howard Lilienthal said that in all cases of sarcoma the patients should be treated post-operatively by a course of Coley's mixed toxins. He was convinced from a long, careful experience that this has a great deal to do with not only the cure of inoperable cases but with the prevention of recurrence. He strongly urged that all these cases be submitted to that treatment.

ACUTE DIFFUSE HÆMORRHAGIC PANCREATITIS

Dr. John E. Jennings presented a woman, twenty-seven years of age, the mother of three children.

Thirty-six hours before her admission to the Brooklyn Hospital, January 17, 1922, she was suddenly seized with pain in the epigastrium which was severe and boring in character, radiating to the back. Nausea and vomiting accompanied the pain and persisted. The pain was not relieved by hypodermic injections of morphine and increased in severity. There was a record of two

CHRONIC PANCREATITIS

previous attacks of similar character but of less severity. The first, three years; the second, six weeks previous. With the last a slight and transient jaundice occurred. There was also an irregular story of digestive disturbance. No other serious illnesses and no operations. She was a well-nourished young woman whose abdomen showed marked tenderness in the epigastrium and right upper quadrant. No masses could be made out; rigidity was moderate. Temperature 99°; blood count 20,350; leucocytes 90 per cent.

polymorphonuclear.

A diagnosis of acute pancreatitis was made and an immediate section made. There was free fluid in the peritoneal cavity and turbid serum stained with blood. The gall-bladder was somewhat thickened and a single stone was palpable within it. The pancreas was enormously enlarged, the head four inches across and two inches thick, the body and tail were proportionately thick, purple and engorged with blood. The duodenum was thickened and ædem-The gastrocolic omentum was separated and the body of the pancreas punctured with a Kocher clamp. Copious alarming hæmorrhage ensued which, however, ceased in a few minutes with evident shrinkage in the gland. Puncture repeated further to the left with the same effect. A third puncture was made in the head of the pancreas beneath and to the right of the duodenum. At the end of this procedure the head and body of the pancreas were found to be about two-thirds their former size. Cholecystostomy with removal of one stone. A suprapubic stab drain of a raffia dressed tube was set in the pelvis. Drains also set near the point of puncture in the capsule of the pancreas. The gall-bladder was drained and the abdomen closed in layers as usual with continuous chromic catgut, interrupted chromic, silkworm-gut stay sutures and silk.

Her convalescence was stormy. A rather active peritonitis was, however, finally controlled and she was discharged from the hospital on the fortieth day after operation. Several attacks of cholecystitis followed, in the fourth of which a cholecystectomy was performed by another surgeon, three years ago.

Since then she has been free from symptoms.

CHRONIC PANCREATITIS

Dr. John E. Jennings presented a man, thirty-eight years of age, who seventeen months ago was suddenly seized with a severe attack of pain in midepigastrium which radiated to the back at the level of the lower ribs. This lasted only a few hours. One year later a similar attack of longer duration was followed by epigastric soreness and nausea for several days. Since that time he has had repeated attacks of indigestion and occasional slight jaundice. He was first seen at his home November 30. Four days ago he had been again seized with sharp epigastric pain and backache with nausea and vomiting. His epigastric tenderness was marked, with no masses and moderate rightsided rigidity. He was slightly jaundiced. He was removed to the Brooklyn Hospital where on a fluid diet with the administration of fluid by rectum in liberal amount his tenderness subsided and his jaundice disappeared. December 6, one week after admission, his icterus index was 17. His coagulation time twelve minutes, his bleeding time seven and one-half minutes, his serum calcium 11.7 milligrams in 100 cubic centimetres. December 7, 1926, an incision was made from the tip of the ensiform downward and outward to a point two inches to the right of the navel. The liver and gall-bladder were firmly adherent to the surface of a scar in the abdominal wall. The stomach and duodenum were intimately adherent to the liver. The pancreas was stony hard throughout its length. The stomach and duodenum were dissected free

from the liver edge, the common duct isolated and opened, found dilated and thickened but without obstruction. The gall-bladder which was markedly thickened but contained no stones was removed with two ligatures on the cystic duct and a separate ligation of the vessels. A T-tube drain was placed in the common duct and a raffia dressed tube to the kidney fossa and the abdomen closed in layers. His convalescence was uneventful and he left the hospital sixteen days after his operation, wearing his common-duct drain and a flask attached to it. Six weeks later after a slight indiscretion in diet he came to the office complaining of: (1) A central umbilical pain which felt "like a gall-stone pain after a hypo". This pain was almost constant and was reflected to the back; (2) a pain which occurred in paroxysms in front of the left nipple and shot through behind the left shoulder; (3) griping pains low in the abdomen; (4) more or less constant nausea; (5) indigestion and heartburn. A day or two of rest on liquid diet and further caution as to his diet in future was followed by disappearance of these symptoms. The tube was allowed to remain in place for 100 days when it was removed and the drainage closed in a few days and the tract closed. He has had a few slight and diminishing attacks of indigestion and epigastric pain since, but is well if he is careful.

Note.—Four years ago after several prolonged attacks of indigestion with remittent epigastric and right hypochonariac pain he was operated on for gall-stones, several of which were removed and he thinks his gall-bladder. He has a right upper abdominal scar extending downward from the tenth costal cartilage for four inches.

DOCTOR JENNINGS presented also, as a case of chronic pancreatitis, a woman, forty-six years of age, who was admitted to the Brooklyn Hospital September 23, 1927, complaining of pain in the right dorsal region radiating to the epigastrium. This pain began two weeks ago quite suddenly. She took warm water and epsom salts. Vomited and was somewhat relieved. days later she had a similar attack which was somewhat more prolonged. Two days before admission the present attack began and has been growing more and more severe. She gave a history of an attack of influenza in 1918 and of an operation for colloid goitre, intrathoracic, six months ago. She was a large, stout, ruddy woman. Examination of her abdomen, which is obese, showed epigastric tenderness, marked on deep pressure with tenderness also present in the right subcostal area. Slight jaundice present. September 27, 1927, an S-curved incision from the tip of the ensiform downward and outward to a point opposite the navel was made. The transversalis was split transversely. The gall-bladder was thick, light in color, adherent to the liver and omentum. It contained many stones. The cystic duct was dilated. The common duct was dilated. The head of the pancreas was hard. The liver was markedly congested, its edge thick and round. The common duct was opened and a stricture found at the ampulla with a small diverticulum containing a stone buried in the head of the pancreas. The stone was removed and the stenosis dilated to 24F with a male sound. The gall-bladder was removed. The vessels and duct were tied separately and a T-tube placed in the common duct. She had a normal convalescence and was discharged October 23. She wore her drain for 100 days with no subsequent inconvenience when it was removed and the sinus promptly closed. She reports herself entirely free from symptoms.

SURGERY OF THE PANCREAS AT ROOSEVELT HOSPITAL BETWEEN 1918–1928

Dr. Alfred Stillman read a paper with the above title, for which see page 58.

DR. Allen O. Whipple said that the making of punctures into the pancreas and incisions through the capsule in cases of acute pancreatitis were associated with definite dangers and difficulties. He had seen one patient operated upon by another surgeon, die on the table as the result of making an incision into the pancreas, and had seen two autopsies in which there was extensive hæmorrhage resulting from it. He can see the reason for making incisions into the pancreas and perhaps they are indicated in very severe types, but thinks it is a great mistake to apply such measures to the pancreatitic cases where the entire organ is not involved. The plunging of instruments into the organ means destruction of more pancreatic tissue and further necrosis of the pancreas. For the reasons mentioned in five cases of acute pancreatitis he has operated upon he has not used this method and his mortality has been twenty per cent.

He felt if incisions or punctures are to be done they should be done with extreme caution and only in cases where there is a very marked swelling and hamorrhage into the pancreas.

Dr. Morris K. Smith said that in going over records of jaundiced patients at St. Luke's Hospital he had found a woman recorded as having carcinoma of the pancreas on whom a cholecystogastrostomy had been done and who was alive and well four years later. This was undoubtedly a case of pancreatitis in the light of end result. It furnishes an argument for anastomosis between gall-bladder and gastro-intestinal tract in suitable cases of supposed pancreatic carcinoma.

Doctor Smith had himself operated on an emaciated jaundiced elderly man in whom an enlarged hard pancreas led to the diagnosis of carcinoma. Cholecystogastrostomy was done. Two months later the patient reëntered the hospital on the medical service with blood sugar of over 300 and glycosuria. He was under treatment for several months during which time the hyperglycæmia and glycosuria cleared up and he was able to take a regular diet. His jaundice, which was never marked, recurred, due probably to contracture of the stoma. His general condition remained about the same. The course of the disease in this patient over a period of six months' observation, during which time there was development of diabetic manifestations with recovery, raises the question as to the possibility of an inflammatory rather than neoplastic lesion in the pancreas.

Dr. Howard Lilienthal said there is one method for diagnosing cancer of the pancreas which is not always thought of and that is the discovery of Virchow's gland in the neck. He has seen three cases illustrating this. He wished also to throw his influence in favor of cholecystogastrostomy in cancer and especially if proven cancer, and if it is not proven cancer and patient is dying of acute jaundice with distension of the gall-bladder it is not going to do any harm. If a patient thus treated remains well for four years this is certainly no argument against the operation. He has heard it spoken against by friends of his own whose opinion he would ordinarily respect because these patients rarely survive for a very long time. If they live a few months without jaun-

dice and itching the patient and his family are well satisfied. One of his most grateful patients died four or five months after this operation and his family were most grateful because of the relief afforded.

Dr. Alexis V. Moschcowitz stated that he has found that patients with carcinoma of the bile ducts and pancreas stand operative interference very poorly. His operative mortality in cases of advanced jaundice, due to carcinoma of the head of the pancreas, has been so appalling even after an ordinary exploratory incision and considerably higher after cholecystogastrostomy or similar operations, that he is now inclined to deny operation when confronted with an undoubted case of carcinoma in this region. Merely to alleviate the not very annoying symptom of itching of the skin is not sufficient indication for him to advise this operation.

As to the paper of Doctor Stillman, Doctor Moschcowitz was in full accord with the opinion expressed by the writer that there are various forms of acute pancreatitis. There are some cases that will absolutely get well without anything being done and there are others that will die whether anything is done for them or not. There remains, however, an intermediate group for which something may be attempted. If there is a definite collection of an exudate or blood in front of the pancreas, Doctor Moschcowitz does not mind incising the peritoneum overlying the pancreas, but he never enters the pancreas itself. He usually drains with large packings of rubber dam. He has succeeded in saving some cases. In the occasional case which is operated upon, usually under mistaken diagnosis and in which small patches of fat necrosis are found throughout the peritoneal cavity without any large exudate in the region of the pancreas and without gall-stones in the gall-bladder, he has usually closed them up without any operative interference upon the gall-bladder. His experience with these cases has been that they do just as well as the cases in which the gall-bladder is drained routinely. It is possible that these patients get well in spite of the cholecystostomy, not because of it.

In this connection, Doctor Moschcowitz related a case operated upon several years ago with a large collection of blood in front of the pancreas. At this time a cholecystostomy was done. The drain was kept up for a very long period, and the patient was about to be discharged with orders to continue the drainage for some time, when suddenly, the patient again became exceedingly ill and had practically the same symptoms as she had at the first operation. A second laparotomy was done and a perfectly fresh hæmorrhage was found in front of the pancreas in spite of the well-functionating cholecystostomy.

Dr. Thomas H. Russell said that cyanosis is a diagnostic sign that he has paid a good deal of attention to in cases of pancreatitis. In every case of pancreatitis that he has seen cyanosis has been present. He has also noticed that pain in the back when associated with a history of gall-bladder disease was very indicative of chronic pancreatic disease. In operating upon cases of acute pancreatitis he thought it wise to make punctures in the pancreas—these are usually done with the finger—then packing in iodoform gauze to control the bleeding, which he had never found difficulty in checking. In one case of acute

pancreatitis he had made several punctures in the head of the pancreas and the patient later developed a large abscess in the tail of the pancreas which made him think that he had not made enough punctures in the pancreas. In operating upon cases of chronic pancreatitis he has made a practice of suturing a small rubber tube in the common duct having the end of the tube to extend into the duodenum and closing the common duct over the tube. The tube remains in position for three months to a year or more and seems to give better results than the simple T-tube as ordinarily used.

Dr. Frank S. Mathews wondered whether the relation of gall-stones to pancreatitis is a simple mechanical one. In one of the cases reported by Doctor Jennings there was a single stone in the gall-bladder and no history of stone passing before the attack of pancreatitis. In one of his own cases he had removed a gall-bladder with stones from a patient who developed a subacute pancreatitis two years later from which she recovered without operation. There was no reason to think in this case of the passage of stone at the time of the pancreatitis. Doctor Stillman had referred to a case of dermoid cyst of the pancreas. In any abdominal viscus, except the ovary, they are exceedingly rare. Bland Sutton said, many years ago, that they never occur in any abdominal viscus except the ovary. This is but another illustration in proof that the word "never" should rarely be used in medicine.

DOCTOR STILLMAN, in closing, spoke of Doctor Russell's warning to look for cyanosis as a symptom of acute pancreatitis; he said that although he knew it was regularly described he had never seen it in pancreatitis. In France, during the war, he had a soldier under his care who had all the typical signs of acute pancreatitis with cyanosis of face and extremities. He got so excited over this typical picture that he asked every doctor he could at the post to see the patient. At autopsy it turned out to be a ruptured ulcer of the sigmoid with generalized peritonitis and no pancreatitis. Until Doctor Lilienthal spoke he was going to say one could not tell chronic pancreatitis from carcinoma of the pancreas. Carcinoma, however, is such a short disease that a wait of a month or two will make the diagnosis by a marked loss of weight and strength. As for incising the pancreas, Doctor Stillman felt the incision should be superficial; he did not see the necessity for going deep and perhaps starting a hæmorrhage. He simply opens the overlying peritoneum, if the disease has not already accomplished this. In answer to Doctor Mathews, he had not meant to lay the blame entirely on stones as a cause of pancreatitis although he thought them most important. Drainage of the gall-bladder may not relieve every case because every case is not secondary to the gall-bladder, but where stone is a factor and there is backflow into the pancreas, drainage of the gallbladder or common duct will probably be helpful.

BRIEF COMMUNICATIONS

SARCOMA OF THE BREAST WITH FOREIGN-BODY AND TUMOR GIANT CELLS*

SARCOMA of the breast with foreign-body giant cells and early local recurrence rarely occurs. In a series of 7763 breasts, or portions of breasts, removed at the Mayo Clinic there were only twenty-nine sarcomas, one of which contained foreign-body giant cells.

REFORT OF A CASE.—The patient, a woman, aged fifty-seven years, registered at the Mayo Clinic, February 5, 1929. She had been married twenty-seven years and had

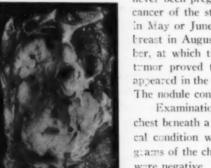


Fig. 1.—Gross section of recurrent nodule.

never been pregnant. One sister was supposed to have died of cancer of the stomach. The patient was struck by a baseball in May or June, 1928, and she first noticed a lump in the left breast in August. She did not consult a physician until October, at which time partial simple amputation was done. The termor proved to be malignant. In January, 1929, a nodule appeared in the scar and one Röntgen-ray treatment was given. The nodule continued to enlarge rapidly.

Examination disclosed three nodules on the left wall of the chest beneath a half circular scar. The patient's general physical condition was good; she had not lost weight. Röntgenograms of the chest, and the Wassermann reaction on the blood were negative. The hæmoglobin was 74 per cent.

Radical operation for recurrent malignant growth of the breast was performed February 8. Four tumors were found, the largest of which was 2.5 centimetres in diameter and was situated six centimetres posterolateral from the scar. The

tumor next in size was two centimetres in d'ameter and was situated just beneath the skin in the suture line. Both tumors were cystic, the larger containing a cyst one centimetre in diameter. These tumors were surrounded by dense fibrous tissue. The two smaller tumors were firm and elastic and were situated higher on the wall of the chest nearer the axilla. Neither contained cysts and they were not encapsulated. The smallest measured 1.25 centimetres in diameter and was embedded in fat. The primary tumor (removed elsewhere) measured approximately three centimetres in diameter, was cystic, and surrounded by dense fibrous tissue. All of the tumors were gray. The absence of enlargement of axillary lymph nodes was striking.

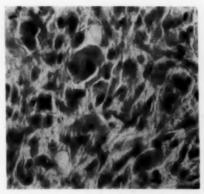
The primary tumor consisted of ovoidal and spindle-shaped cells of varying size and lying in a somewhat hyaline matrix. The cytoplasm of these cells stained pink with eosin and the nuclei varied in shape and staining reaction. There were many capillaries throughout the tissue and also hæmorrhagic cystic degenerating areas which contained many foreign-body giant cells. These giant cells were round, ovoidal and irregular in shape and contained as many as seventy-five nuclei which resembled endothelial cells, lying in a smooth pink cytoplasm. Through the tissue were many mitotic figures and also tumor giant cells and foreign-body giant cells. The recurrent nodules which were removed showed the same picture as the primary tumor. (Figs. 1, 2 and 3.) In all the tumors there were a few scattered or collected fat cells.

^{*} Submitted for publication May 3, 1929.

SARCOMA OF THE BREAST

Mammary sarcomas are commonly described as adenosarcoma, adenocystic sarcoma, and so forth, some of which contain foreign-body giant cells. The occurrence of the epithelial glandular element in their structure is most easily accounted for by assuming that they develop in tumors of glandular

architecture, many of whose elements persist in spite of the sarcomatous change of the connective tissue. Any variety of sarcoma may appear in benign tumors,² If the cells are small and fairly solid, the sarcoma is usually described as round-cell or spindle-cell, and if giant cells are present, as giant-cell sarcoma.⁴ Although the presence of the glandular element is sometimes noted, its significance is often neglected in naming the tumor. There are tumors described as having the characteristics of sarcoma and carcinoma.³ If the tumor is large and if cysts have formed in it, all

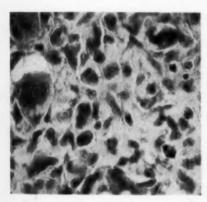


Figs. 2 and 3.—Foreign-body giant cells, tumor giant cells, and mitotic figures. (X320)

else is likely to be lost sight of and the sarcoma is called cystosarcoma, cystic sarcoma, cystadenosarcoma, or adenocystic sarcoma; if cartilage or bone is found the tumor is called chondrosarcoma, osteosarcoma, ossifying sarcoma or ostcochondrosarcoma. Usually by examination of the tumor after removal,

and frequently by microscopic study of various portions, the correct pathologic diagnosis can be made.^{5, 6}

The giant cells seen in the tumors in the case reported here were of two kinds, the foreign-body giant cells and the true tumor giant cells, with the former greatly in excess. The foreign-body giant cells were similar to those seen in giant-cell tumors of bone, tuberculosis, gumma, surrounding a foreign substance such as linen or catgut, blood pigment, or cholesterin crystals. Mallory believes that the foreign-



F10. 3.—See Fig. 2.

body giant cells are formed by fusion of endothelial leucocytes. Maximow, however, believes that they come from wandering or free histiocytes. The true tumor giant cell differs from the foreign-body giant cell by having large irregular nuclei and frequently a mitotic figure.

SUMMARY

This is the first case of sarcoma with foreign-body and tumor giant cells occurring in a series of 7763 breasts, or portions of breasts, removed at the

BRIEF COMMUNICATIONS

Mayo Clinic. The recurrent nodules were noticed about four months after the primary tumor was removed. Primary tumor and secondary nodules all contained foreign body and tumor giant cells.

WILLIAM L. A. WELLBROCK, M.D., of Rochester, Minn.

From the Section on Surgical Pathology of the Mayo Clinic.

BIBLIOGRAPHY

- Broders, A. C.: Benign Xanthic Extraperiosteal Tumor of the Extremities Containing Foreign-body Giant Cells. Annals of Surgery, vol. lxx, pp. 574-581, 1919.
- ² Deaver, J. B., and McFarland, Joseph: The Breast; Its Anomalies, Its Diseases, and Their Treatment. P. Blakiston's Son and Co., Philadelphia, vol. vii, pp. 372– 441, 1917.
- ⁸ Ewing, James: Neoplastic Diseases. Third Edition. W. B. Saunders, Philadelphia, pp. 1054, 1928.
- ⁴ Helwig, F. C.: Carcinoma of the Breast Combined with a Giant-cell Sarcoma. Arch. Path. and Lab. Med., vol. iv, pp. 162–167, 1927.
- ⁶ MacCarty, W. C.: Carcinoma of the Breast. Tr. South. Surg. and Gynec. Assn., vol. xxiii, pp. 262-270, 1910.
- ⁶ MacCarty, W. C.: A Key to Diagnosis and Prognosis of Neoplastic Lesions of Bones. Radiology, vol. viii, pp. 277–281, 1927.
- Mallory, F. B.: The Principles of Pathologic Histology. W. B. Saunders, Philadelphia, pp. 677, 1914.
- ⁸ Maximow, A.: Relation of Blood Cells to Connective Tissues and Endothelium. Physiol. Rev., vol. iv, pp. 533-563, 1924.

AN IMPROVED DRAINAGE TUBE

Drainage tubes usually used in the surgical clinics are either too soft and collapsible, vis., the Penrose tube: the cigarette drain consisting of a strip of gauze drawn through a Penrose tube which, after a few hours, loses its capillarity, because the gauze becomes saturated with the fluid drainage material, the cigarette drain collapses and drainage ceases; or rigid drainage tubes which cause pressure necrosis or hæmorrhage when near a blood vessel. It occurred to me that if we could combine the above types without the disadvantages mentioned, we would have an ideal drainage tube.

With this premise in mind, last year, in my division, on the service of Dr. Joseph Tenopyr, at the Kings County Hospital, I devised the following tube (Fig. 1) which proved satisfactory in draining empyema, suppurative appendicitis, cholecystectomy, etc. In consists, as per illustration, of three equal lengths of Penrose tubing, two of which are cut lengthwise. Placing one upon the other, on their convex surfaces, they are rolled like a cigarette, rather tightly and with a forceps drawn through the uncut piece. This makes a firm tube, yet not rigid, not causing pressure necrosis or hæmorrhage, always patent, does not kink. Any diameter Penrose tubing may be used in making this tube to suit the given case. We have used one-half inch for nephrectomy,

RETROPERITONEAL HERNLÆ

three-quarter inch for suppurative appendicitis, and cholecystectomy, one inch for empyema, several one-inch tubes for pelvic abscess drained through the cul-de-sac of Douglass. The tubes have been left for ten days or more in some of these cases, and at no time, when removed, have we found the

tube collapsed or kinked. Another advantage with this type of drainage tube is, that if it becomes plugged, the inner rolled cut pieces may be removed and fresh rolled pieces reinserted without any inconvenience to the patient. This tube, like all other drainage tubes, is transfixed with a safety pin, to prevent it from falling into the wound.

The designation "No. 83," is because it was on ward No. 83, at Kings County Hospital, where this new type of drainage tube was first used. "New." because after a rather careful search of the literature, I have been unable to find it described. As a matter of fact, through my request, the research bureau of Nelson Loose-leaf Surgery referred this question to its editor-in-chief, Dr. Allen O. Whipple. His answer, quoting his own words, "So far as I know this has not been described in the literature."

Gaetano de Yoanna, M.D., of Brooklyn, N. Y.

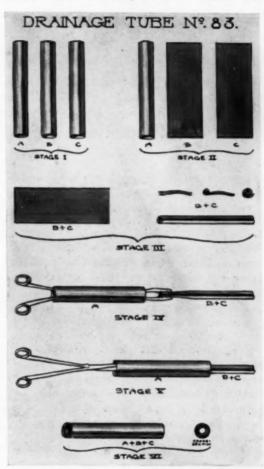


Fig. 1.—Stage I: Three equal-size Penrose tubings (A-B-C). Stage II: Two tubings (B-C) are cut open. Stage III: Cut tubings are placed one upon the other (B+C), convex sides up, and tightly rolled together upon these sides to have a successful result. Stage IV: A long forceps is placed through uncut tubing (A) and then ends of forceps hold rolled tubings (B+C) tightly in place. Stage V: Uncut tubing (A) is drawn over rolled tubings (B-C). Stage VI: (B+C) released, distend in (A) and form one.

RETROPERITONEAL HERNIÆ

Case I.—Coil of ileum incarcerated in posterior peritoneal pouch.—A man, fifty-one years of age, was admitted to Brooklyn Hospital February 23, 1928, on account of abdominal pain and vomiting. One week before admission, he began to suffer from cramp-like pains in lower abdomen; temporary relief was experienced by a cathartic. For two days preceding admission, the previous pains and constipation had returned. Physical

BRIEF COMMUNICATIONS

examination was negative except for moderate tenderness in the abdomen. A gastrointestinal series of X-ray pictures was taken and interpreted by the radiologist as indicating obstruction of the small intestine in its proximal half. On the fourth day after admission, condition having persisted, the abdomen was opened under local anæsthesia followed by gas anæsthesia. A large mass of distended ileum was exposed. This was traced to the right iliac fossa where a broad peritoneal band was found, at the edge of



Fig. 1.-Coil of ileum incarcerated in postperitoneal pouch.

which the distended ileum collapsed. This band proved to be the anterior layer of a large peritoneal pouch in which lay about a foot of collapsed ileum. (Fig. 1.) The anterior wall of this pouch was divided freely, laying the space wide open. Following this division, the distended gut gradually contracted and the collapsed gut gradually distended. There was no gross damage to the internal wall at any part. The abdominal wound was closed in the usual manner; uncomplicated recovery followed. The patient was discharged on the eighteenth day after operation. Three months later he was reëxamined and reported perfectly well.

CASE II .- Sequestration of appendix in

retrocolic fossa.-A male, twenty-four years of age, was admitted to the Brooklyn Hospital July 18, 1929, with the history that for three days he had been suffering from pain referred to the right lower abdominal quadrant. This was accompanied with nausea. On admission, there was marked rigidity and tenderness over the right lower rectus muscle. Temperature 99; pulse 60; respirations 20; white-blood cells 7800; polymorphonuclears 74 per cent. The abdomen was promptly opened by incision through the lower right rectus muscle which exposed the right iliac fossa, but no appendix appeared. Strong traction on the cæcum upward and to the left revealed the appendix folded and fixed in the external retrocolic fossa. (Fig. 2.)



Fig. 2.-Appendix folded in retrocolic fossa,

The appendix was removed. It was ten centimetres long and one centimetre in diameter. Its serosa was roughened and the subserous veins were congested. The wall of the appendix was thickened. Sections of the appendix showed marked venous distention and ædema in the tissue spaces; no inflammatory exudate present. Patient made uninterrupted recovery and was discharged on the fourteenth day.

> JOHN H. LONG, M.D., Brooklyn, New York.

BOOK REVIEWS

A SURGICAL DIAGNOSIS, by J. LEWI DONHAUSER, M.D. Large octavo; cloth; pp. 799. New York, D. Appleton & Co., 1929.

It is but a few months (see Annals of Surgery, March, 1929) since the book of the London surgeon, Walton, on "Surgical Diagnosis" was the subject of review in the Annals of Surgery. Here comes a new book from an American clinic, the author of which has been a teacher of surgical diagnosis to students for some twenty years. The book is announced as essentially one for medical students, hospital residents and general practitioners. As one turns its pages, the impression is strong that it is the outgrowth of methods of class instruction which the author has developed during his many years in the class room. This is especially emphasized in the frequency with which charts are employed to present the differential diagnosis of various conditions. The author states, in his preface, that illustrations have purposely been omitted except in the chapter on Fractures and Dislocations. Notwithstanding this, the book assumes proportions that are notable both for the number and size of the pages.

The value of illustrations in a treatise on diagnosis is so great and their use is so imperative, that their absence must necessarily greatly detract from the value of any treatise devoted to the subject of surgical diagnosis and yet, their use in any adequate number must necessarily so swell the size of any book as to take it out of the category of a handbook at once, destroy its usefulness as a class-room textbook for students and relegate the book to the domain of books for reference. This is well illustrated in the "Surgical Diagnosis and Treatment," edited by the late Albert J. Ochsner, by its four large volumes. The book on "Surgical Diagnosis" which perhaps is most nearly comparable to this one of Donhauser is that of De Quervain (1926), which is about the same length (pages 937) but contains 750 illustrations. If one chooses for purposes of comparison such a subject as Tumors of the Side of the Neck, one cannot help but realize the extreme importance and value of such a series of illustrations as the book of the Berne surgeon presents as placed by the side of the meagreness and insufficiency of the information on the subject which the pages of the Albany surgeon, devoid of illustrations, give to their readers. And so, one might go on through many other subjects. On the other hand, the book of Donhauser has its own merits. Special importance and value are attributed to proper history taking and a considerable amount of space is devoted to proper methods of procedure. The regional and etiological charts, which have already been mentioned, are a special feature of the book. These, however, are redolent of the class room and really need the presence and exposition of the teacher for their proper use.